Contents

In the News

Story 1:
Tonight's Cygnus launch kicks off three ISS cargo runs in three weeks

Story 2:
New Gravity Map Gives Best View Yet Inside Mars

Story 3:
Kepler Catches Early Flash of an Exploding Star

Departments

The Night Sky
ISS Sighting Opportunities
Space Calendar
NASA-TV Highlights
Food for Thought
Space Image of the Week
1. Tonight's Cygnus launch kicks off three ISS cargo runs in three weeks (Blog Post by Jason Davis, The Planetary Society)

Just days after receiving three new crew members, the International Space Station is about to become a veritable shipping hub, as three cargo ships launch to the orbital laboratory in as little as three weeks.

Later tonight, an Orbital ATK Cygnus spacecraft kicks off the action, making a late night trip to orbit courtesy of a United Launch Alliance Atlas V rocket. Cygnus is stuffed with three-and-a-half tons of supplies—its largest cargo haul to date. Included on the manifest are pressurized air tanks, a spacesuit and a suite of science experiments, one of which will light a controlled fire inside the discarded Cygnus after it is jettisoned from the ISS.

The Cygnus is named the S.S. Rick Husband, honoring the late shuttle commander who was killed in 2003 with six other astronauts when space shuttle Columbia was destroyed during reentry.

Watch: Orbital ATK Cygnus OA-6 launch

Launch: Tuesday, March 22, at 11:05 p.m. EDT (3:05 UTC Wednesday)
Launch window: 30 minutes; five opportunities at five-minute increments
NASA TV coverage starts 10:00 p.m.

Solar array deployment: Approximately 12:45 a.m. EDT Wednesday

Arrival and berthing: Saturday, March 26, 6:40 a.m. EDT
NASA TV coverage starts 5:30 a.m.

On-orbit duration: Approximately 55 days

Cygnus will spend three-and-a-half days traveling to the station. On Saturday morning, astronauts Tim Kopra and Tim Peake will grapple the spacecraft and berth it to the Earth-facing port of the station's Unity module.

Next, Russia's Progress M-29M cargo craft, stuffed with trash for destructive atmospheric reentry, will depart from the station's aft Zvezda module. On March 31, a new Progress is scheduled to lift off from Baikonur, Kazakhstan.

Finally, a week later, SpaceX's Dragon will return to action in a much-anticipated launch on April 8. That flight will carry the Bigelow Expandable Activity Module, BEAM, to the station. BEAM is an inflatable habitat that will spend two years attached to the station's Tranquility node.

The coming weeks will be a busy time for the crew of Expedition 47, as they shuffle cargo in and out numerous spacecraft.
"When you think about the upcoming cargo traffic, it's good to have six crewmembers," said Kenneth Todd, the station's operations integration manager. He noted that when Dragon arrives, it will mark the first time both of NASA's commercial cargo partners—SpaceX and Orbital ATK—have had a vehicle berthed to the station simultaneously.

"For those of us that have worked through this transition from shuttle into this commercial cargo service, it's really a neat thing for us to be able to see both of these vehicles up there at the same time," he said.

Dragon will depart first, after spending about a month on orbit. Because Dragon is the only ISS vehicle capable of returning a significant amount of cargo, NASA has a backlog of items waiting to return to Earth. "We've got a full slate of things to come home," Todd said.

Tonight's launch marks the second and final Atlas-propelled Cygnus mission ordered in the wake of the loss of an Orbital ATK Antares rocket in 2014. Orbital officials continue to prepare Antares for a return-to-flight with its newly installed, Russian-built RD-181 engines.

Frank Culbertson, the president of Orbital's space systems group, said the inaugural dual-engine hotfire would take place this spring, clearing the way for a summer Antares-Cygnus flight.

"The exact date will depend on NASA's need," Culbertson said. "We'll be ready in early summer for a launch anytime that they need it."

The intense period of cargo shuffling places ISS logistics back on solid ground following a series of resupply mishaps. "We're going to be in good shape on consumables after this mission," Todd said. "We're in pretty good shape now; this will just extend us out further in the year for some of those consumables that we like to keep our eye on."

Source: Planetary Society
2. New Gravity Map Gives Best View Yet Inside Mars

A new map of Mars' gravity made with three NASA spacecraft is the most detailed to date, providing a revealing glimpse into the hidden interior of the Red Planet.

"Gravity maps allow us to see inside a planet, just as a doctor uses an X-ray to see inside a patient," said Antonio Genova of the Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts. "The new gravity map will be helpful for future Mars exploration, because better knowledge of the planet's gravity anomalies helps mission controllers insert spacecraft more precisely into orbit about Mars. Furthermore, the improved resolution of our gravity map will help us understand the still-mysterious formation of specific regions of the planet." Genova, who is affiliated with MIT but is located at NASA's Goddard Space Flight Center in Greenbelt, Maryland, is the lead author of a paper on this research published online March 5 in the journal Icarus.

The improved resolution of the new gravity map suggests a new explanation for how some features formed across the boundary that divides the relatively smooth northern lowlands from heavily cratered southern highlands. Also, the team confirmed that Mars has a liquid outer core of molten rock by analyzing tides in the Martian crust and mantle caused by the gravitational pull of the sun and the two moons of Mars. Finally, by observing how Mars' gravity changed over 11 years -- the period of an entire cycle of solar activity -- the team inferred the massive amount of carbon dioxide that freezes out of the atmosphere onto a Martian polar ice cap when it experiences winter. They also observed how that mass moves between the south pole and the north pole with the change of season in each hemisphere.

The map was derived using Doppler and range tracking data collected by NASA's Deep Space Network from three NASA spacecraft in orbit around Mars: Mars Global Surveyor (MGS), Mars Odyssey (ODY), and the Mars Reconnaissance Orbiter (MRO). Like all planets, Mars is lumpy, which causes the gravitational pull felt by spacecraft in orbit around it to change. For example, the pull will be a bit stronger over a mountain, and slightly weaker over a canyon.
Slight differences in Mars' gravity changed the trajectory of the NASA spacecraft orbiting the planet, which altered the signal being sent from the spacecraft to the Deep Space Network. These small fluctuations in the orbital data were used to build a map of the Martian gravity field.

The gravity field was recovered using about 16 years of data that were continuously collected in orbit around Mars. However, orbital changes from uneven gravity are tiny, and other forces that can perturb the motion of the spacecraft had to be carefully accounted for, such as the force of sunlight on the spacecraft’s solar panels and drag from the Red Planet's thin upper atmosphere. It took two years of analysis and computer modeling to remove the motion not caused by gravity.

"With this new map, we've been able to see gravity anomalies as small as about 100 kilometers (about 62 miles) across, and we've determined the crustal thickness of Mars with a resolution of around 120 kilometers (almost 75 miles)," said Genova. "The better resolution of the new map helps interpret how the crust of the planet changed over Mars' history in many regions."

For example, an area of lower gravity between Acidalia Planitia and Tempe Terra was interpreted before as a system of buried channels that delivered water and sediments from Mars' southern highlands into the northern lowlands billions of years ago when the Martian climate was wetter than it is today. The new map reveals that this low gravity anomaly is definitely larger and follows the boundary between the highlands and the lowlands. This system of gravity troughs is unlikely to be only due to buried channels because in places the region is elevated above the surrounding plains. The new gravity map shows that some of these features run perpendicular to the local topography slope, against what would have been the natural downhill flow of water.

An alternative explanation is that this anomaly may be a consequence of a flexure or bending of the lithosphere -- the strong, outermost layer of the planet -- due to the formation of the Tharsis region. Tharsis is a volcanic plateau on Mars thousands of miles across with the largest volcanoes in the solar system. As the Tharsis volcanoes grew, the surrounding lithosphere buckled under their immense weight.

The new gravity field also allowed the team to confirm indications from previous gravity solutions that Mars has a liquid outer core of molten rock. The new gravity solution improved the measurement of the Martian tides, which will be used by geophysicists to improve the model of Mars' interior.

Changes in Martian gravity over time have been previously measured using the MGS and ODY missions to monitor the polar ice caps. For the first time, the team used MRO data to continue monitoring their mass. The team has determined that when one hemisphere experiences winter, approximately 3 trillion to 4 trillion tons of carbon dioxide freezes out of the atmosphere onto the northern and southern polar caps, respectively. This is about 12 to 16 percent of the mass of the entire Martian atmosphere. NASA's Viking missions first observed this massive seasonal precipitation of carbon dioxide. The new observation confirms numerical predictions from the Mars Global Reference Atmospheric Model – 2010.

Click here to view video of how this map was created.

Source: NASA
**3. Kepler Catches Early Flash of an Exploding Star**

The brilliant flash of an exploding star's shockwave -- what astronomers call the "shock breakout" -- has been captured for the first time in visible light by NASA's planet-hunter, the **Kepler space telescope**.

An international science team led by Peter Garnavich, an astrophysics professor at the University of Notre Dame in Indiana, analyzed light captured by Kepler every 30 minutes over a three-year period from 500 distant galaxies, searching some 50 trillion stars. They were hunting for signs of massive stellar death explosions known as supernovae.

In 2011, two of these massive stars, called red supergiants, exploded while in Kepler's view. The first behemoth, KSN 2011a, is nearly 300 times the size of our sun and a mere 700 million light-years from Earth. The second, KSN 2011d, is roughly 500 times the size of our sun and around 1.2 billion light-years away.

"To put their size into perspective, Earth's orbit about our sun would fit comfortably within these colossal stars," said Garnavich.

Whether it's a plane crash, car wreck or supernova, capturing images of sudden, catastrophic events is extremely difficult but tremendously helpful in understanding root causes. Just as widespread deployment of mobile cameras has made forensic videos more common, the steady gaze of Kepler allowed astronomers to see, at last, a supernova shockwave as it reached the surface of a star. The shock breakout itself lasts only about 20 minutes, so catching the flash of energy is an investigative milestone for astronomers.

"In order to see something that happens on timescales of minutes, like a shock breakout, you want to have a camera continuously monitoring the sky," said Garnavich. "You don't know when a supernova is going to go off, and Kepler's vigilance allowed us to be a witness as the explosion began."
Supernovae like these -- known as Type II -- begin when the internal furnace of a star runs out of nuclear fuel, causing its core to collapse as gravity takes over.

The two supernovae matched up well with mathematical models of Type II explosions reinforcing existing theories. But they also revealed what could turn out to be an unexpected variety in the individual details of these cataclysmic stellar events.

While both explosions delivered a similar energetic punch, no shock breakout was seen in the smaller of the supergiants. Scientists think that is likely due to the smaller star being surrounded by gas, perhaps enough to mask the shockwave when it reached the star's surface.

"That is the puzzle of these results," said Garnavich. "You look at two supernovae and see two different things. That's maximum diversity."

Understanding the physics of these violent events allows scientists to better understand how the seeds of chemical complexity and life itself have been scattered in space and time in our Milky Way galaxy.

"All heavy elements in the universe come from supernova explosions. For example, all the silver, nickel, and copper in the earth and even in our bodies came from the explosive death throes of stars," said Steve Howell, project scientist for NASA's Kepler and K2 missions at NASA's Ames Research Center in California's Silicon Valley. "Life exists because of supernovae."

Garnavich is part of a research team known as the Kepler Extragalactic Survey or KEGS. The team is nearly finished mining data from Kepler's primary mission, which ended in 2013 with the failure of reaction wheels that helped keep the spacecraft steady. However, with the reboot of the Kepler spacecraft as NASA's K2 mission, the team is now combing through more data hunting for supernova events in even more galaxies far, far away.

"While Kepler cracked the door open on observing the development of these spectacular events, K2 will push it wide open, observing dozens more supernovae," said Tom Barclay, senior research scientist and director of the Kepler and K2 guest observer office at Ames. "These results are a tantalizing preamble to what's to come from K2!"

Click here to view visualization of the Kepler team finding.

Source: JPL
The Night Sky

Tuesday, March 22

- Full Moon tonight, and a penumbral lunar eclipse. This is a weak eclipse, with the Moon's southern side skimming only through the pale outer fringe of Earth's shadow (the penumbra). Skywatchers in western North America will see it before dawn Wednesday morning; the eclipse is deepest at 4:47 a.m. PDT; 5:47 a.m. MDT. For Australia and East Asia, the event falls on the evening of March 23rd local date (deepest at 11:47 March 23rd UT/GMT).

Penumbral it may be, but it counts toward your life tally of lunar eclipses you have observed. Fainter penumbral shading may be detectable for nearly an hour before and after the mid-time.

Wednesday, March 23

- As the stars come out this week, Jupiter and Sirius are the two brightest points in the sky — Jupiter in the east-southeast, Sirius toward the south. They'll be at exactly the same height right around nightfall for those of us near latitude 40° north (for example Denver, New York, Madrid). If you're south of there they balance a little later; north of there, a little earlier.

Thursday, March 24

- The Moon, two days past full, rises in the east-southeast around the end of twilight and climbs through the rest of the evening. Spot Spica about 4° to its lower right (for North America), and brighter Arcturus almost 30° to the Moon's upper left.

Friday, March 25

- By about 11 p.m. the bowl of the Big Dipper stands upside down high in the north-northeast, straight over the bowl of the dim Little Dipper as if dumping water into it. They do the reverse in the fall.

Source: Sky & Telescope
ISS Sighting Opportunities

For Denver:

<table>
<thead>
<tr>
<th>Date</th>
<th>Visible</th>
<th>Max Height</th>
<th>Appears</th>
<th>Disappears</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tue Mar 22, 4:24 AM</td>
<td>&lt; 1 min</td>
<td>10°</td>
<td>10° above NNE</td>
<td>10° above NNE</td>
</tr>
<tr>
<td>Tue Mar 22, 5:58 AM</td>
<td>3 min</td>
<td>29°</td>
<td>10° above NW</td>
<td>28° above NE</td>
</tr>
<tr>
<td>Wed Mar 23, 5:07 AM</td>
<td>2 min</td>
<td>20°</td>
<td>16° above NW</td>
<td>18° above NE</td>
</tr>
<tr>
<td>Thu Mar 24, 4:17 AM</td>
<td>&lt; 1 min</td>
<td>12°</td>
<td>12° above NE</td>
<td>12° above NE</td>
</tr>
<tr>
<td>Thu Mar 24, 5:50 AM</td>
<td>6 min</td>
<td>63°</td>
<td>10° above NW</td>
<td>10° above ESE</td>
</tr>
<tr>
<td>Fri Mar 25, 5:00 AM</td>
<td>2 min</td>
<td>34°</td>
<td>31° above N</td>
<td>20° above E</td>
</tr>
</tbody>
</table>

Sighting information for other cities can be found at NASA's Satellite Sighting Information

NASA-TV Highlights
(all times Eastern Daylight Time)

10 p.m., Tuesday, March 22 - Coverage of the Launch of the Orbital/ATK CRS-6 Mission to the ISS (Launch scheduled at 11:05 p.m. ET) (all channels)

12:30 a.m., Wednesday, March 23 - Coverage of the Solar Array Deploy for the Orbital/ATK Cygnus CRS-6 Spacecraft (Time subject to change) (starts at 12:45 a.m.) (all channels)

1 a.m., Wednesday, March 23 - Orbital/ATK CRS-6 Post-Launch News Conference (time subject to change) (all channels)

8 a.m., Thursday, March 24 - ISS Expedition 47 In-Flight Interviews with National Public Radio’s “How to do Everything” Program and Wired Magazine with Commander Tim Kopra of NASA and Flight Engineers Jeff Williams of NASA and Tim Peake of the European Space Age (starts at 8:10 a.m.) (all channels)

6 a.m., Friday, March 25 - Live Satellite Media Interviews on “Artic Sea Ice Maximum" (NTV-3 (Media))

3 p.m., Friday, March 25 - Replay of the ISS Expedition 46 Welcome Home Ceremony at the Gagarin Cosmonaut Training Center in Star City, Russia with Astronaut Scott Kelly of NASA and Cosmonauts Mikhail Kornienko and Sergey Volkov of Roscosmos (Recorded earlier in the day) (all channels)

3:30 p.m., Friday, March 25 - Video File of the ISS Exp. 46 Welcome Home at the Gagarin Cosmonaut Training Center and Interviews with NASA Adm. Charles Bolden, Astronaut Scott Kelly of NASA and Cosmonaut Mikhail Kornienko (Recorded earlier in the day) (Starts at 3:45 p.m.) (all channels)

Watch NASA TV on the Net by going to the NASA website.  

Return to Contents
Space Calendar

- Mar 22 [Mar 21] Cygnus CRS-6 (OA-6)/ KickSat 2 Atlas 5 Launch (International Space Station)
- Mar 22 - [Mar 18] Comet P/2016 BA14 (PANSTARRS) Near-Earth Flyby (0.024 AU)
- Mar 22 - Comet 107P/Wilson-Harrington At Opposition (3.299 AU)
- Mar 22 - Asteroid 51915 (2001 QF71) Occults HIP 29434 (4.9 Magnitude Star)
- Mar 22 - [Mar 19] Amor Asteroid 2016 FZ2 Near-Earth Flyby (0.062 AU)
- Mar 22 - Asteroid 5040 Rabinowitz Closest Approach To Earth (1.846 AU)
- Mar 22 - Asteroid 2127 Tanya Closest Approach To Earth (2.282 AU)
- Mar 22 - Dwarf Planet 136472 Makemake At Opposition (51.568 AU)
- Mar 22 - 20th Anniversary (1996), STS-76 Launch (Space Shuttle Atlantis, Mir Space Station)
- Mar 22 - Rich Terrile's 65th Birthday (1951)
- Mar 22 - Musa Manarov's 65th Birthday (1951)

- Mar 23 - [Mar 16] Penumbral Lunar Eclipse
- Mar 23 - Apollo Asteroid 2016 CY135 Near-Earth Flyby (0.036 AU)
- Mar 23 - [Mar 16] Apollo Asteroid 2016 EF157 Near-Earth Flyby (0.042 AU)
- Mar 23 - Apollo Asteroid 2016 EF86 Near-Earth Flyby (0.047 AU)
- Mar 23 - Asteroid 7934 Sinatra Closest Approach To Earth (1.296 AU)
- Mar 23 - Asteroid 3672 Stevedberg Closest Approach To Earth (1.394 AU)
- Mar 23 - Gary Kronk's 60th Birthday (1956)

- Mar 24 - Comet 201P/LONEOS Closest Approach To Earth (2.902 AU)
- Mar 24 - Comet 206P/Barnard-Boattini At Opposition (3.529 AU)
- Mar 24 - Comet C/2014 R3 (PANSTARRS) Closest Approach To Earth (7.181 AU)
- Mar 24 - Apollo Asteroid 2016 EQ1 Near-Earth Flyby (0.021 AU)
- Mar 24 - [Mar 17] Amor Asteroid 2016 EJ158 Near-Earth Flyby (0.060 AU)
- Mar 24 - 5th Anniversary (2011), Stardust Depletion Burn - End of Mission

- Cassini, Orbital Trim Maneuver #444 (OTM-444)
- Mar 25 - [Mar 22] Comet 104P/Kowal Closest Approach To Earth (1.806 AU)
- Mar 25 - Comet 148P/Anderson-LINEAR Closest Approach To Earth (2.009 AU)
- Mar 25 - Comet 213P/Van Ness At Opposition (2.836 AU)
- Mar 25 - Comet 213P-B/Van Ness At Opposition (2.838 AU)
- Mar 25 - [Mar 22] Apollo Asteroid 2016 FW3 Near-Earth Flyby (0.022 AU)
- Mar 25 - Apollo Asteroid 1994 UG Near-Earth Flyby (0.044 AU)
- Mar 25 - [Mar 19] Apollo Asteroid 2016 FX2 Near-Earth Flyby (0.057 AU)
- Mar 25 - Amor Asteroid 2016 CB30 Near-Earth Flyby (0.090 AU)
- Mar 25 - Asteroid 6032 Nobel Closest Approach To Earth (1.845 AU)
- Mar 25 - Asteroid 13681 Monty Python Closest Approach To Earth (1.968 AU)
- Mar 25 - Asteroid 397 Vienna Closest Approach To Earth (2.303 AU)
- Mar 25 - 20th Anniversary (1996), Comet Hyakutake Near-Earth Flyby (0.10 AU)
- Mar 25 - 55th Anniversary (1961), Sputnik 10 Launch (Carried Dog Named Zvezdochka)
- Mar 25 - 205th Anniversary (1811), Honore Flaugergues Discovers The Great Comet of 1811
- Mar 25 - Giovanni Amici's 230th Birthday (1786)
Thirty-five years after they launched on board the "world's greatest all-electric flying machine," the astronauts who flew aboard NASA's first two space shuttle missions are set to land in Houston this September for an anniversary celebration.

STS-1 pilot Robert Crippen, STS-2 commander Joe Engle and STS-2 pilot Richard Truly, who with Engle proved that the space shuttle was reusable, will be the honored guests at a dinner on Sept. 17 at Space Center Houston in Texas, the Astronaut Scholarship Foundation (ASF) announced.

"It was an honor for me to fly [on] STS-1 with John Young," Crippen told collectSPACE.com, as he looked to the event this fall. "Everyone involved with the space shuttle program — and there were tens of thousands — put in a lot of blood, sweat and tears to make it a success. I was proud to be a part of proving their hard work had paid off."

Young and Crippen lifted off aboard the maiden flight of the space shuttle Columbia on April 12, 1981 (by coincidence, 20 years after the first human spaceflight in 1961). For two days and 36 orbits of the Earth, the two astronauts tested the winged vehicle on its first mission, opening and closing its payload bay, firing its orbital maneuvering and reaction control system thrusters, and putting the orbiter's avionics controls through its paces.
On April 14, they safely re-entered the Earth's atmosphere and landed Columbia on the dry lake bed at Edwards Air Force Base in California, despite hundreds of the shuttle's thermal heat shield tiles being damaged.

"Columbia on that first flight demonstrated that she was everything we had hoped for and more," said Crippen.

Unlike NASA's previous spacecraft, the shuttle, or Space Transportation System (STS), was developed to be largely reusable, with the external tank being the only component discarded on each mission.

Columbia's second mission, STS-2, marked the first time in history that a piloted space vehicle launched again.

"Over a six-month period in 1981, the space shuttle made its maiden flight, then turned around and demonstrated it could be re-used, flying again. It was a great privilege and a load of fun to be involved with the thousands who made these remarkable events happen," said Truly.

Engle and Truly launched on board Columbia on Nov. 12, 1981. During the two-day mission (cut short by three days due to a failed fuel cell), they operated the space shuttle's Canadarm robotic arm for the first time and the orbiter was used for its first remote sensing observations of the Earth.

In another first, Engle manually piloted Columbia through a part of its re-entry and through the approach and landing, touching down at Edwards in California on Nov. 14, 1981.

"Tens of thousands of the finest administrators, managers, designers, fabricators, technicians and operators in the world committed their professional talents and reputations to produce the world's first and finest reusable spacecraft," Engle said. "They all did their jobs superbly."

"John, Crip, Richard and I were selected as [the] pilots to demonstrate just how superb and professional a job they had done," added Engle. "It was an honor to represent this team... it was humbling."

Crippen, Engle and Truly will further recount their historic flights at the ASF's dinner in Houston. Their success led to a fleet of five shuttle orbiters flying a total of 135 missions over the 30-year program. The final space shuttle mission, STS-135, landed five years ago this July.

Dan Brandenstein, who served as a CapCom (spacecraft communicator) in Mission Control during both STS-1 and STS-2 and who today is the chairman of the ASF's board of directors, will be emcee for the evening. Brandenstein is also a veteran astronaut, including commanding the orbiter Endeavour's maiden mission in 1992.

When tickets go on sale April 1, guests will have the option to also tour NASA's Johnson Space Center and have their photo taken with the astronauts. Jacobs Engineering and Texas A&M University have partnered as sponsors for the event.

The Astronaut Scholarship Foundation was founded by the Mercury astronauts in 1984 to award students excelling in undergraduate science and engineering degrees. Since its inception, the ASF has bestowed more than $4 million in scholarships to more than 400 of the nation's top scholars.

In addition to presenting the STS-1 and STS-2 celebration in September, the ASF is also hosting the gala for the U.S. Astronaut Hall of Fame induction on May 13-14 at NASA's Kennedy Space Center Visitor Complex in Florida. Tickets for that event are available now through the ASF website at astronautscholarship.org.

Source: Space.com
Hubble Unveils Monster Stars

Credit: NASA, ESA, and P. Crowther (University of Sheffield)

An international team of astronomers using the ultraviolet capabilities of NASA's Hubble Space Telescope has identified nine monster stars with masses over 100 times the mass of the sun in the star cluster R136. This makes for the largest sample of very massive stars identified to date. The results, which will be published in the Monthly Notices of the Royal Astronomical Society, raise many new questions about the formation of massive stars. R136 is only a few light-years across and is located in the Tarantula Nebula within the Large Magellanic Cloud, about 170,000 light-years away from Earth. The young cluster hosts many extremely massive, hot, and luminous stars whose energy is mostly radiated in the ultraviolet.