Issue 7 January 2026

Event Horizon

The magazine of STARFLEET Sciences

2024 STARFLEET Newsletter of the Year

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The science of Santa

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Event Horizon is edited by CAPT Pam Kingsley.
Deputy editor COL Patrick Litton.

Submissions are welcomed - please send them to **sfsci-eheditor@sfi.org**

Cover image: The moon - winning image from SFSCI's International Observe the Moon contest © Angelique Anderson R2

"Somewhere, something incredible is waiting to be known."
— Carl Sagan

From the Director's Office

Season's Greetings!

The principles of IDIC, Infinite Diversity in Infinite Combinations, could not be better represented than during this season when over 20 holidays are celebrated around the world! I especially love the Winter Solstice, the longest night of the year. I take corn, bird seed, apples, peanuts, and carrots out to the woods on Solstice Day as a gift to the animals, a tradition I have done for 40 years.

My message is a simple one. May we all share peace, kindness, and compassion and continue our journey to be the best humans we can be in the spirit of Star Trek. I celebrate all of you and wish you a great 2026!

To the stars!

Barb Barton

FCAPT Barb Barton
Director, STARFLEET Sciences

From the Editor's Desk

Happy new year, and welcome to the first *Event Horizon* of 2026!

Apologies for being a few days late with this issue. We had a few production issues, which have sadly meant I've had to hold back one article for the next issue. Despite that, this is still packed with all types of science, from every day LED car headlights to trying to answer the question of how Santa manages to deliver all his presents in one night.

We are also launching the all-auxiliary Wellness Challenge in this issue, which as both Deputy Director of Sciences and the Assistant Surgeon General of R20, I highly recommend getting involved in!

Also in this issue, if you enjoy looking at astrophotography, you're in for a treat! We have a 13-page report on the PEP-2 mission, which saw SFSCI members taking pictures of the night sky for a month. We celebrated International Observe the Moon Night, and invited members to send in their pictures of the moon. A selection of the best images are featured here, including the stunning picture on our cover taken by Angelique Anderson in R2.

f you have any comments, feedback, suggestions or content you would like to contribute for a future issue, please send it to **sfsci-eheditor@sfi.org**

Pam Kingsley

CAPT Pam KIngsley,
Deputy Director, STARFLEET Sciences, & *Event Horizon* editor

Ask the staff - What was your science and/or Trek highlight of 2025?

1LT Matthew Chrysler, Chief of Staff

For me it was experiencing my first SFI Interational Convention. It was an experience I wish everyone could have.

1LT Sarah Holloway, Awards & Honours Officer

My favorite *Trek* thing to happen in 2025 is this- after decades of my kids rolling their eyes at my father and I being Trekkies, they finally started watching it this year. They started with *TOS* then finished *TNG* and some of the movies. They are in the middle of *DS9* now and it's so fun to finally get to talk *Trek* with them

LCDR Diane "Rip" Ripollone, Chief of Education

Favorite Science thing was when the Lead Scientists for JPL's JUNO mission spoke with my classes. Of course work related.

Favorite *Star Trek* thing - my new *Star Trek* socks that I got at our grab bag during our Chapter Christmas party.

CAPT Pam Kingsley, Deputy Director

My Trek highlight was being Garak in "The trial of Benjamin Sisko" at a con in the summer. That was a lot of fun!

My favourite science thing is that I've finally got myself a telescope and I'm just starting to learn how to use it.

FCAPT Barb Barton, Director

Favorite thing? The warm messages from Sciences members sharing how much our Auxiliary means to them.

SFSCI joined in with NASA's annual International Observe the Moon Night in October by hosting a moon cbservation competition.

Entries were accepted from individuals, chapers, regions of Scientific Research Teams into the following categories:

- Best Photo or Video
- Best Drawing or Sketch
- Most Creative Observation Setup
- Best Team Collaboration (chapter or group entry)
- Most Inspiring Story (personal connection to the Moon / observation experience)
- Most submissions for a Region

The aim was to have fun and enjoy our moon, and the winners are showcased in the following pages.

Congratulations to all our winners and participants! You've made this lunar celebration unforgettable.We look forward to doing this again next year.

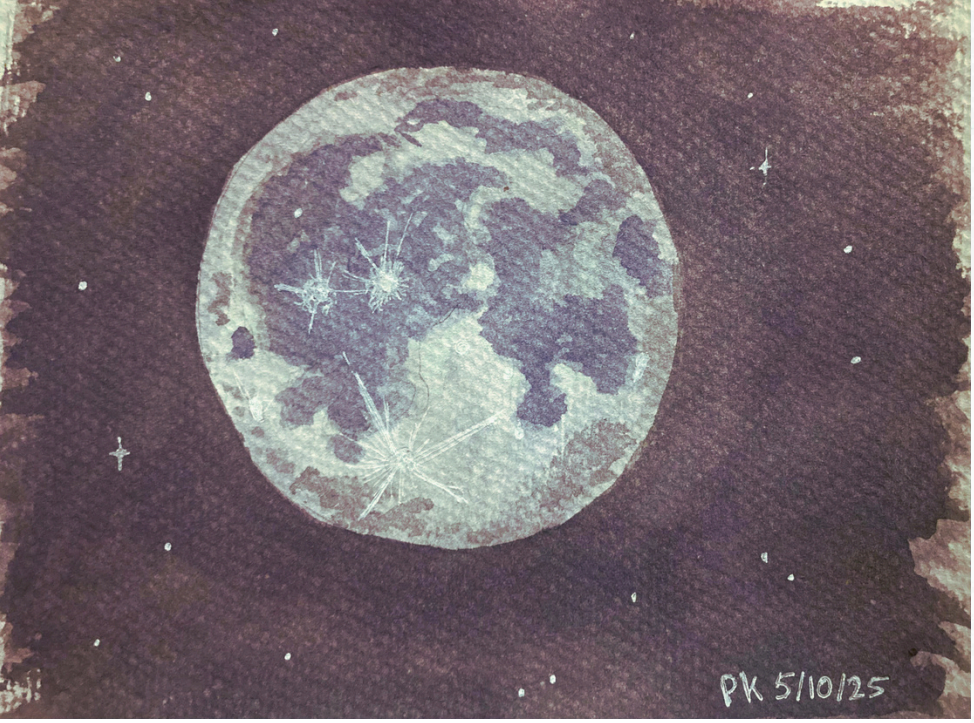
Your creativity, passion, and stories lit up the night sky—and now it's time to celebrate the brightest stars in each category:

Best Photo or Video

1st Place (above left):
Angelique Anderson R2

2nd Place (left):
Stephanie Mitchell R12

3rd Place (above):
'Hunter-Supermoon' by Michael Urvand R6



Best Drawing or Sketch

1st Place (above left): Pam Kingsley R20

2nd Place (above right): Lisa Collins R12

Best Team Collaboration (Chapter or Group Entry)

Joint 1st Place: USS Antares R5 &

SRT-72402 Shoemaker's Watchers R1

Most Inspiring Story

(Personal Connection to the Moon / Observation Experience)

1st Place: Sam McClanahan R1

I grew up under dark skies in rural west Tennessee, where an inexpensive family telescope, a blanket, and a pile of science magazines were enough to turn meteor nights into exciting away missions. My earliest "hook" wasn't a discovery through the eyepiece so much as a puzzle in my own perception; how the Harvest Moon could loom on the horizon, huge and theatrical, yet still be small enough to hide behind a pinkie at arm's length. That tension between wonder and perception has followed me ever since.

I was born in early 1969, and my mother tells a story (probably greatly exaggerating for effect) that the first thing I showed interest in was the television broadcast of the Apollo 11 moon landing. She says that I nearly squirmed out of her grasp trying to reach for the television set the family were watching those historic first moments on. Whether embellished or not, the story fits. The Moon remains my first love, and the night sky still feels like home.

This year I've re-entered the starfield in earnest. I joined STARFLEET and the STARFLEET Sciences auxiliary in late August, and the first group activities I've registered for are NASA's International Observe the Moon Night and the PEP-2 Hubble Expedition. I've started lean, only an iPhone and an inexpensive beginner-friendly telescope, while I research apps, filters, and local star-gazing spots.

Most Submissions: Region 1

Pictures (clockwise from right) by Elizabeth Jewell (USS Kitty Hawk), Sarah Holloway (USS Kitty Hawk), Spring Brooks (USS Kitty Hawk), Sam McClanahan (USS Asgard)

SOL SPEAKER SERIES

The Sol Speaker Series lectures is a monthly online event free to SFI members bringing interesting and inspiring presentations on a variety of science topics - with the opportunity to ask questions at the end of the talks.

Next talk: January 17th, 11am EST/4pm GMT
“We are Stardust: The Interconnection of All Things”
Speaker: Barb Barton, Astrophotographer

What connects all things on this beautiful and unique planet we call home? Can we reach deep into our collective universal past to understand that everything is carefully intertwined and dependent on everything else?

Filmmaker Barb Barton presents a visually stunning and thought-provoking journey into the origin and interconnection of all things in her award winning documentary short “We Are Stardust: The Interconnection of All Things” (15 min runtime).

Following the film, she will share her astrophotography and talk about her journey from being an endangered species biologist and nature photographer working in the rarest Earth-based places to turning her eyes to the sky. Q and A discussion will follow.

Coming soon: February 21, 2026 11am EST/4pm GMT
“Analog Space Missions - What are they and how can they inform what we do in space?”
Speaker: Mike Urvand, Analog Astronaut and NASA JPL Solar Ambassador

For as long as people have been traveling in space, scientists and engineers have been creating analog facsimiles of equipment and missions to test procedure and hardware against what astronauts might encounter while on orbit. Now analog missions have entered the private sector and with it, the opportunity for "regular" people to explore space without leaving the ground.

Mike Urvand, when not commanding Region Six, has been an Analog Astronaut and Science Educator for the last five years. He joined NASA's Jet Propulsion Laboratory as a Solar System Ambassador in 2023 where he gives presentations to groups of all sizes on relevant topics regarding space. He has been on two separate analog space missions as well as presented during the 2024 Total Solar Eclipse. He is planning on another trip to observe the 2026 eclipse and hopefully will be participating in a Mars mission simulation in 2027.

To participate or watch live, you need to get the link by registering **here**.

All previous talks are available at the **STARFLEET International YouTube channel.** If you have any suggestions for topics or speakers for future talks, email **sfsci-director@sfi.org**

Zoom Caption Translator is available at the Sol Speaker Series Events! For instructions on how to use it, visit https://sciences.sfi.org/zoom-caption-translator-instructions/

Where Is Our Place in the Universe?

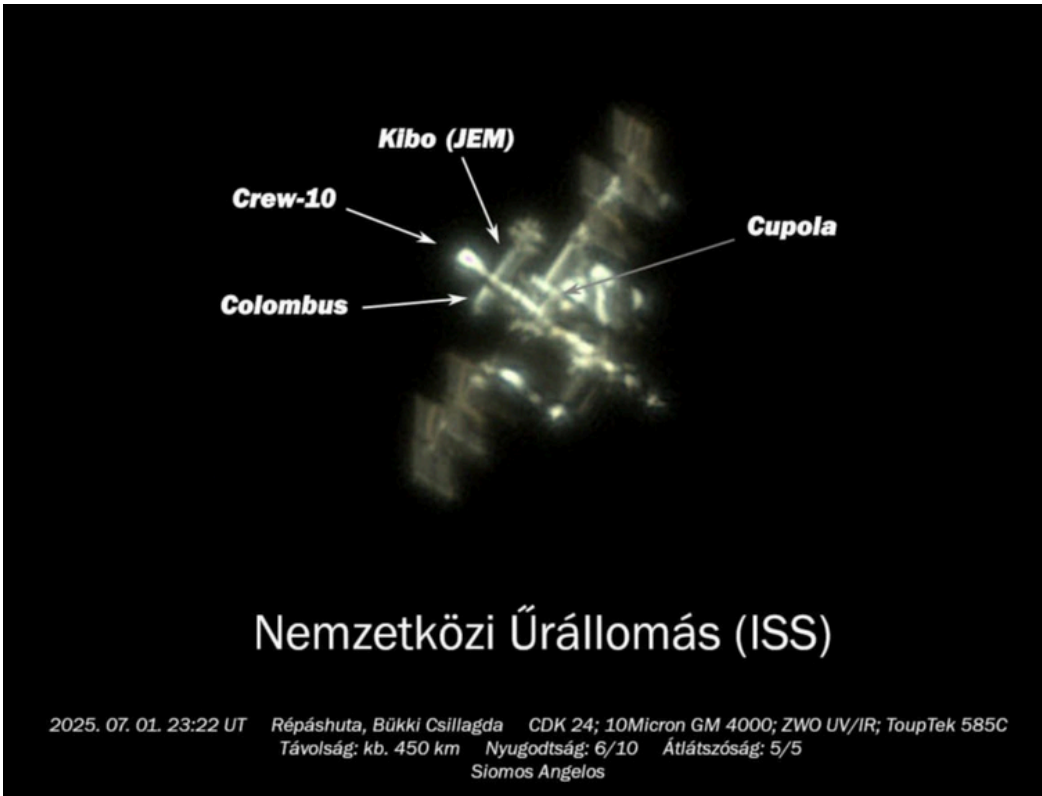
Reflections of an everyday astrophotographer from the edge of eternity

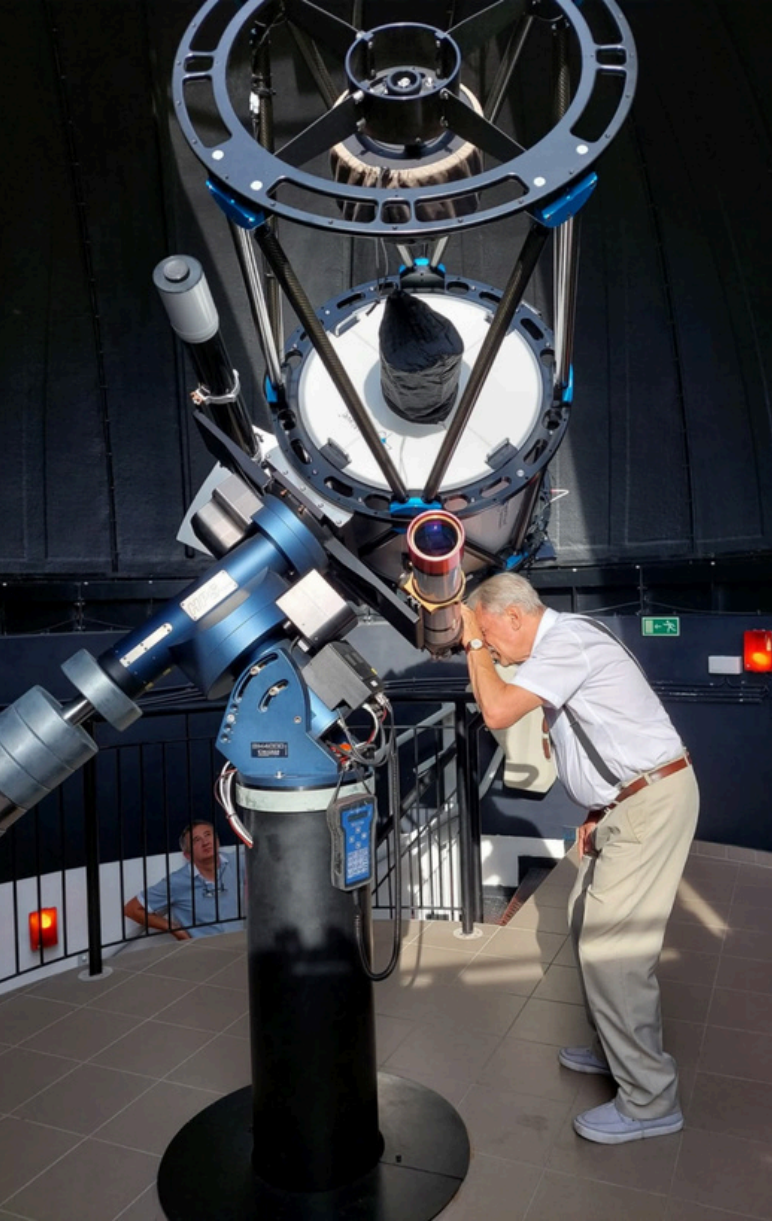
Words and images by LT Gábor Nagy;
Amateur astronomer, astrophotographer, R9 Sciences Liaison

Few questions in human history have followed us as persistently as the one that echoes within us again and again: Where is our place in the Universe? Perhaps it is born the moment we first look up at the cold, bluish night sky as children and feel an inexplicable pull toward the distant lights. It follows us through the dusty lenses of old telescopes, accompanies our first long exposures, and merges with the mirrors of modern giant observatories that allow us to peer into the depths of cosmic history.

I find myself returning to this question constantly — whether in my own garden on the outskirts of Végegyháza, where the silence feels like interstellar emptiness, or under the dome of the Bükk Observatory, where I often feel as though I've stepped onto the bridge of a Starfleet research vessel.

Star Trek's philosophy echoes in me: "Discovery is our birthright." And indeed, every time I look up at the sky, I feel that I am part of a much larger story.





Perhaps I felt this most profoundly when standing before the giant telescope of the Bükk Observatory *(image left)*. The moment I stepped into the dome and saw that immense mirror, I felt myself shrink. It was as though I stood there as a navigational officer aboard a starship, surrounded by the soft hum of instruments and the cool glow of the dome. Within the depths of the telescope, it was not only the stars that shimmered—**time itself glimmered back at me**. Every photon that reached the detector carried a message from the past: it had begun its journey decades, centuries, or even millions of years ago.

And when I photograph the sky at home with my own equipment, capturing exposures of 3–10 seconds, I take part in the very same process. For every astrophotographer — in the truest and most beautiful sense — is **a time traveler**. Our tools are not warp drives or starships, but patience, curiosity, and humility before the cosmos.

Yet the bond between humanity and the Universe reaches deeper still. Every atom within us—the carbon forming our biological foundation, the oxygen we breathe, the calcium in our bones, the iron coursing through our blood—was born in the death throes of stars. In the cooling heart of a dying sun, in the explosive fury of a supernova, or in the collapsing core of a giant long gone, the particles that make up our bodies were forged.

This is why, when the rosy glow of the Orion Nebula appears on my screen, I do not see a distant object. **I see our origin.**
The Universe is not something outside of us.
We are the Universe becoming aware of itself.

This realization is both humbling and liberating. If we were born of stardust, then we all come from the same source. And when we return to that dust from which we came, every moment, every thought becomes part of a greater whole.

The night sky remains, in a strange way, one of the last great constants. The quiet nights of Békés County, the slow fall of darkness across the Viharsarok region—these are places where one can still encounter nature in its original form. Standing at the end of my garden, I see the same stars our ancestors saw—and the same stars will be seen by those who come after us.

The sky is like a cosmic journal: it preserves galaxies, watches over the dance of planets, and tells stories of stars long gone.
And with each new photograph, I feel myself draw a little closer to the answer I seek.
Is there a place for an ordinary person in this vast Universe?
Each time I press the shutter, the answer comes quietly, yet unmistakably: yes.

Sh2-188, taken at Érpatak, Hungary, 7th November 2025

The Universe, in its own way, is like a mirror. It is not kind, not cruel, not biased—simply honest. The laws of physics hold true whether or not we understand them. Stars do not bend the truth. Photons cannot be persuaded. Gravity accepts no excuses.

This honesty reflects back on us:
What do we do with our time?
What do we do with our lives?
What do we do with this planet we call home?
Astronomy is not an escape—it is a return to what truly matters.

Star Trek has taught me something profound: that the future is not written by technology, but by curiosity. Warp drive is merely a tool. A starship, merely a home. The true engine has always been within us. When I work aboard the USS Versailles—whether in community or imagination—I am doing the very same thing I do when photographing the Moon's terminator or the faint edges of a distant galaxy.
I am exploring.

The philosophy of Starfleet is deeply human:
"We seek the answer to who we are, where we came from, and where we are going."

Every astrophotographer seeks the same—whether standing in a garden, on a hilltop, or beneath a great observatory dome.
So the ultimate question is not where our place is in the Universe.
The answer is not found in a single star, a coordinate, or a spiral arm.
Our place is wherever we ask questions.
Wherever we seek the light.
Wherever we create and share what stardust reveals to us.

Our place is at the edge of curiosity—where science meets wonder, and where the human spirit touches the quiet of the cosmos.
And if this journey has taught me anything—whether in my village's silent garden, under the dome of the Bükk Observatory, or among the Starfleet community—it is that the real question is this:
What will we do with the place we have been given?

As for me—an everyday astrophotographer, a Starfleet officer in my dreams—I can only say this:
Our place is wherever the light still reaches.

Where the human being born of stardust continues seeking its origins.

Where darkness is not frightening—**only yet unexplored.**

At STARFLEET, we personify excellence, teamwork and commitment to every task we undertake. Join us to bring that same energy to our own health & wellness and start 2026 with energy and momentum.

For the next three months, auxiliaries across the Fleet will embark on themed missions designed to support mindfulness, fitness, nutrition, rest, and community connection.

Here's how it works:

• 🌱 Choose from a variety of missions — Vulcan Mindfulness, Deanna's Mental Health, Neelix's Nutrition, Starfleet Bootcamp, Phlox's Sleep & Hydration, and Ten Forward Community Fun.

• 🏆 Earn points for each activity you complete (from meditation and journaling to workouts, creative expression, healthy meals, and more).

• 🎖️ At the end of the challenge, certificates will be awarded to all participants, with top winners recognized individually and by Auxiliary.

For more information join the Facebook group **STARFLEET Auxiliary Wellness Challenge 2026**

Expedition Report: PEP-2 (Hubble)

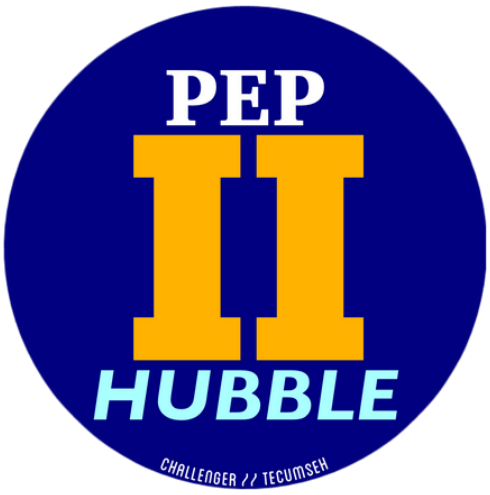
By LTJG Vince Ceraso – SRT coordinator and Expedition Leader, USS Challenger

On April 24, 1990, Space Shuttle Discovery took off from Launch Complex 39B for STS-31, the 35th Space Shuttle mission. Sitting inside the payload bay was a revolutionary new telescope built by NASA with help from the European Space Agency. On April 25, the astronaut crew deployed it into low Earth orbit using the Remote Manipulator System (RMS).

Known as the Hubble Space Telescope (HST), it went on to document some of the greatest pictures in the history of astronomy. The most famous Hubble photograph is the “Pillars of Creation”, showing new stars being born in a distant nebula. Hubble, as well as the James Webb Telescope, have taken deep space photographs that suggest the universe is tens of billions of years old. Many discoveries were also made thanks to HST, such as universe expansion (via dark energy), supermassive black holes that reside at the centers of galaxies, and more.

The second long-duration mission of the Pathfinders Expedition Program (PEP) was one of astrophotography and stellar cartography. PEP-2, the

Hubble Expedition, saw STARFLEET officers photographing the night sky. Mission specialists were encouraged to do so anyway they saw fit: smartphone, professional equipment, telescope observatory, instant-picture, anything. PEP expeditions are all about diversity of methods.



Like future papers for the Expedition Report, this time around, you'll be hearing directly from the mission specialists themselves with excerpts from science logs during PEP-2!

Lastly, being that I am the coordinator for the SRT (Scientific Research Team) Program at STARFLEET Sciences and lead researcher of Archer's Pathfinders SRT-1676D, I was happy to see we had quite a few SRT researchers involved with this expedition. You'll hear about those teams' findings in this report. SF Sciences will soon be launching a virtual science log for all SRTs to share their activities, so keep an eye out for that.

If you are interested in starting your own SRT, please visit the Programs section of the STARFLEET Sciences website and fill out an application.

Before we dive in, Fleet Captain Barb Barton, Director of STARFLEET Sciences and co-leader of this expedition, would like to say a few words:

"This crew did an amazing job testing out their skills with new equipment, problem solving when they couldn't get images to turn out

the way they wanted them, showing extreme patience with the weather and adapting by taking pictures of clouds or sharing information on constellations and planets. They performed their mission brilliantly and produced some great images of the moon, stars, constellations, and nebulae.

“The journey into astrophotography is filled with setbacks and frustrations. Sometimes you want to give up. But in true STARFLEET fashion, our specialists dug deep and pressed forward. It is the moment when you finally create that image that blows your mind that all the hard work becomes worth it. Congratulations to all the Mission Specialists for a job well done, please continue to post your new photos to our Astrometrics Facebook page. Your mission doesn't end here. It is only the beginning as you are now part of Astrometrics Visual Imaging Team!

“Thank you also to our SRT Coordinator LTJG Vince Ceraso for creating the PEP missions!

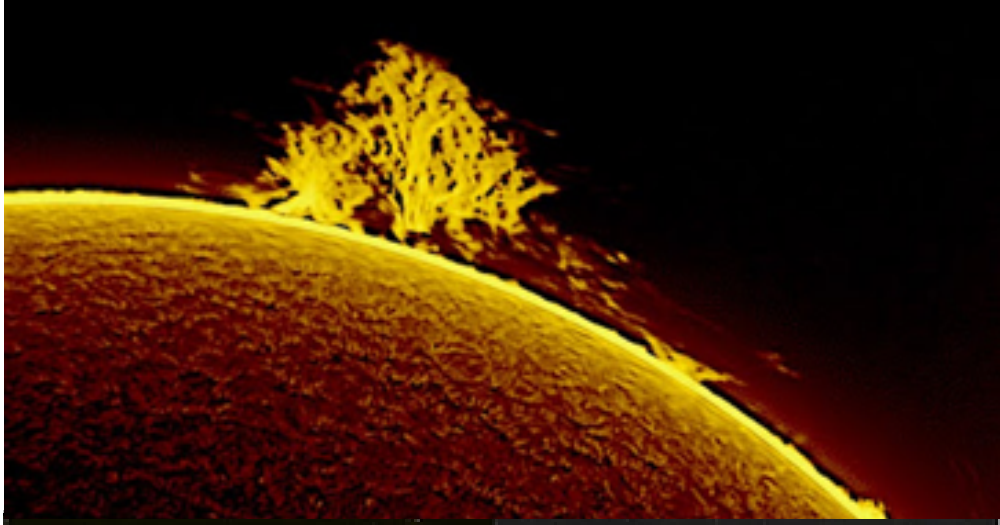
“To the Stars!”

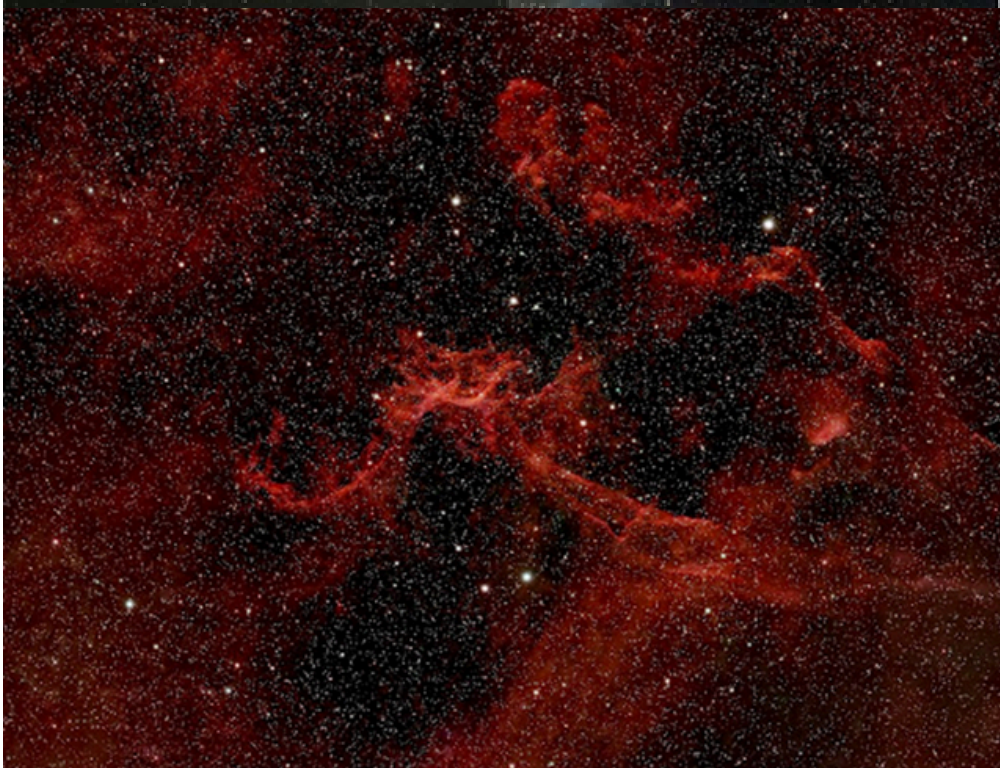
FCAPT Barb Barton
PEP II Co-leader
Director, Sciences Auxiliary

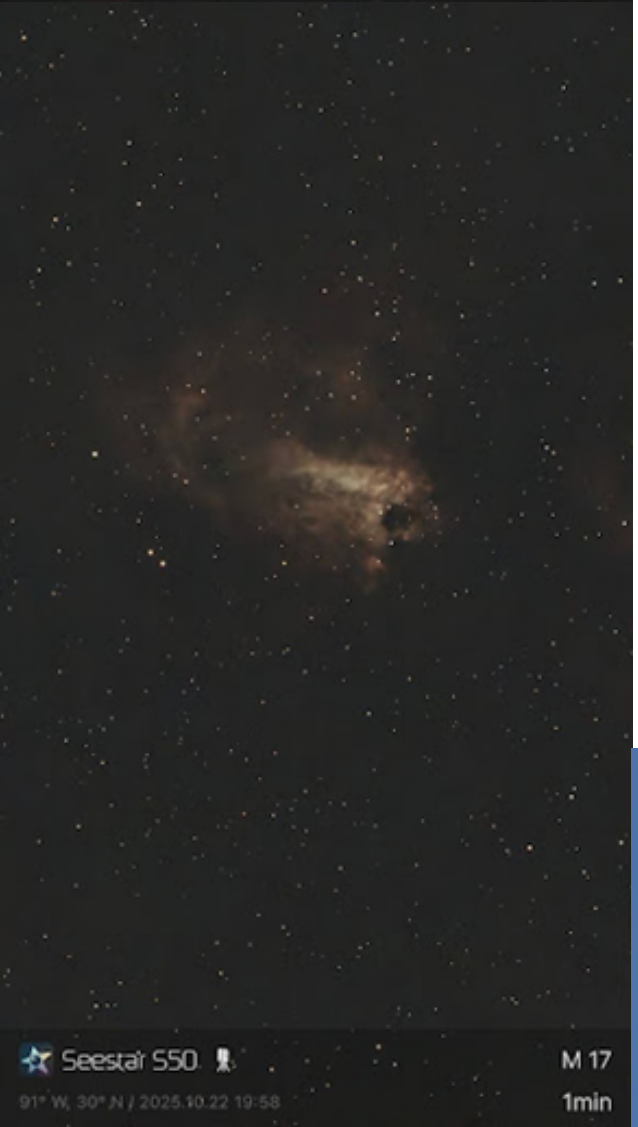
Let’s take a look at what our mission specialists uncovered during the 30-day expedition. Starting with FCAPT Barton who shot several images of Sol on October 12, noting for her log, “Amazing prominence visible!” *(top, next page)*

From the USS Tecumseh science officer's log: "Sept 29, Oct 15, 20, and 30. C2025 A6 (Lemmon) comet image, *(centre)* including one with an hour's worth of satellites! The sky pollution of the satellites is very sad. We had a few clear nights during this expedition and I took advantage of them!"

Objects visible to the naked eye weren't the only targets for our mission specialists. As noted on October 23rd by FCAPT Barton: "The Flying Dragon nebula... Sh 2-113 (Sharpless 113) also known as the Flying Dragon Nebula or LBN 333, is a nebula that resembles a supernova remnant (SNR) but with no evidence to support it being an SNR. Sh 2-113 is located in the northern hemisphere constellation of Cygnus south of the star Deneb." *(bottom)*







While the Hubble Expedition was in full swing, the STARFLEET Sciences Astrometrics Lab celebrated and participated in Observe the Moon Night, an international effort to educate the public on lunar science and exploration. One of the event participants was Lieutenant Angelique Anderson of the USS Draco Ignis, who took an incredible shot of the Moon during the event. *(see front cover - ed)*

As well, the lieutenant captured shots of the Lagoon Nebula, M8 *(top left)* and Swan Nebula, M17 *(bottom left)*. Details of these nebulae aren't visible to the naked eye, but the lieutenant's trusty SeeStar telescope provides a glimpse into a new frontier the human race has only scratched the surface of.

While there are dozens of bright, visible stars in each nebula, the Lagoon and Swan nebulae are estimated to play host to hundreds, if not thousands of other stars. Astronomers believe that there are still young stars forming in each interstellar cloud.

SF Sciences' Observe the Moon event was a rousing success and we had many submissions. PEP-2 mission specialist, Lance Corporal Lisa Collins of the USS Blackstone, was another participant. With Lance Corporal Frost of Petfleet by her side, the two best friends captured some neat shots of the Moon *(below)*.

LCPL Collins even took the liberty of tracking the movements of other celestial bodies besides Earth using a smartphone app. From her expedition log, “Frost and I have been keeping up with the track of the planets in the viewing of Luna—Neptune and Saturn have both been in the picture this month and it has been quite enjoyable to see them tracking so closely together.”

Quite a few staff members of STARFLEET Sciences have participated in the Pathfinders Expedition Program, including our Chief of Education Lieutenant Commander Diane Ripollone, USS Kitty Hawk member, ambassador for NASA, and lead researcher for Voyagers of Discovery SRT-1659. They are the first SRT to be fully crewed instead of just having the standard lead researcher/assistant lead researcher duo. Including LCDR Ripollone and Ensign Darrin Sutherland as LR and ALR, nine Kitty Hawk officers in total are part of the Voyagers.

On October 4th, during our Observe the Moon event, LCDR Ripollone photographed old Luna. Writing in her personal expedition log, “The photo shows the Mare on the moon *(next page)*. Also, the crater (Tycho Crater) near the southern part of the moon.”

Two nights later, noting in her expedition log, “Pretty sure it was the Orion Constellation I photographed *(below)* and caught a faint cloud in the lower left of the picture. Or could it be a nebula?”

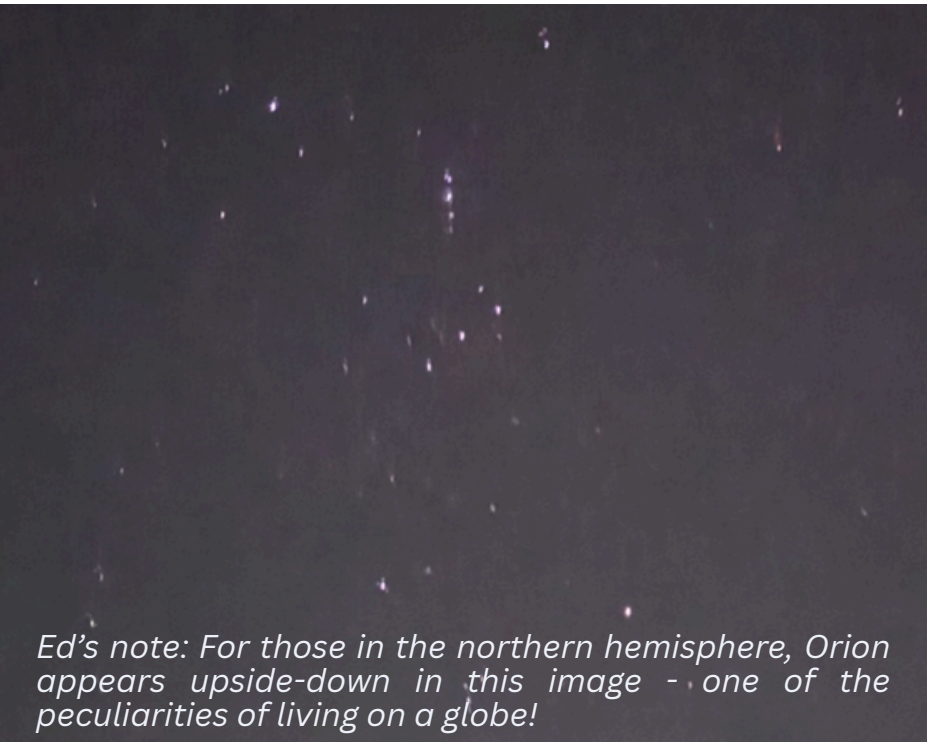
LCDR Ripollone went on to mention she used a special astrophoto setting in her smartphone. Likewise, on October 15, the Voyagers SRT lead researcher noted in her log the smartphone settings she used to take a picture of the starry night sky *(above)*: “Looking NE, Pisces and Pegasus were visible. Using my phone Samsung S25+ 7 mm f/2.4 10 Sec ISO 400.”

Over in Region 8, Commander Ronel du Preez of STATION Charlton (Deep Space 8) was another Observe the Moon participant. Below is her contribution for the event, which also coincided with the Hubble Expedition.

Along with the Moon, CMDR du Preez observed the Orionids meteor shower. As reported in her science log: “Falling stars are obviously not stars but bits and pieces of debris-left behind by a comet and a few asteroids. I focused on the Orionids as they were active during the time of my study.” During the shower, shooting (or falling) stars are most prominent in the constellation of Orion, hence Orionids. Its peak this year was October 21-22, 2025.

Using her smartphone, the DS8 science officer and Diplomatic Corps staffer took pictures of the night sky during meteor shower observations.

CMDR du Preez, like many of us during this expedition, used various astronomy field guides to aid her understanding of constellations and stars. According to the mission specialist, books she utilized during the expedition include the *2025 Sky Guide Southern Africa* by the Astronomical Society of Southern Africa, *Beginner's Guide to Observing the Constellations* by Errol Jud Coder, National Geographic's *Atlas of the Night Sky*, and more.



Ed's note: For those in the northern hemisphere, Orion appears upside-down in this image - one of the peculiarities of living on a globe!

One of the primary constellations observed by the commander was Orion. In her science log, she made note of some of the stars in the Orion constellation. Most notably Beta Orionis, also known as Rigel, the blue supergiant that shines the brightest of all the Orion stars. Using her Galaxy S25 Ultra, Commander du Preez snapped another photo of the Orion constellation.

It's universally agreed upon that night is the best time to not only see the Moon and stars, but photograph them. Although, depending on where you are, you don't have to wait until the sun goes down to catch a glimpse of space.

Armed with Nikon cameras and equipment, ISS Kidd mission specialists Lieutenant Janet Livingston and Petty Officer Third Class David Livingston made Moon observations from Region 3. They took turns photographing, often during the day

Chief of Communications LT Livingston is not only a staff member of STARFLEET Sciences, but is lead researcher of The Lab Rabbits SRT-4321, one of our many scientific research teams (SRT)—COL Kelly Hays is the lieutenant's assistant lead researcher.

Some days later, LT Livingston took a picture late in the morning, where in the blue skies above Texas, the Moon was still very much visible.

The Lab Rabbits SRT is all about botany, the scientific study of plants. LT Livingston went on to note in her expedition log: "As a botanist, most of my time is spent looking at the ground for specimens. Whether I'm walking or driving, I'm scanning the roadsides for flora. Since joining the PEP-2 Hubble Expedition, I've wondered how our ancestors might have interpreted the moon and other celestial bodies."

Using a Nikon D500 with VR 28 - 300mm lens, PO3 Livingston took a picture of a Waning Gibbous moon that occurred around halfway into the expedition.

As SF Sciences director FCAPT Barton said earlier, mission specialists learned to adapt to obstacles during their observations. Many reports indicated dense cloud coverage for many nights—sometimes even weeks—in a row.

But like any resourceful STARFLEET officer, USS Kitty Hawk member and PEP-2 mission specialist 1LT Sarah Holloway took an opportunity to study the clouds one night. “Although there are no stars, it’s still very pretty. (...) I believe these are called altocumulus clouds,” the first lieutenant wrote in her expedition log. Altocumulus clouds can often signal incoming bad weather, which would explain 1LT Holloway’s reports of rain.

Fortunately, there were still plenty of clear nights for observations. 1LT Holloway took pictures of the Cygnus constellation *(below left)* and compared her smartphone photographs to Stellarium’s massive constellation archive. Stellarium is a popular, free smartphone application used for stargazing, with every star and constellation identified for the users to read all about. Mission specialists made great use of Stellarium not only during PEP-2, but during PEP-1, the Galileo Expedition.

Using an iPhone, the USS Kitty Hawk member used moon mode on the mobile device to take a picture of a Waxing Crescent moon *(below right)*. What’s more, her son and hopefully a future STARFLEET officer tagged along for the last leg of the journey: “Very happy my son has taken an interest in this the last few nights.”

Last but not least, two relatively new officers, dynamic duo Ensigns Sam and Brea McClanahan from the USS Asgard, not only joined the Hubble Expedition but formed our most recent Scientific Research Team, The Shoemaker's Watchers SRT-72402. With the motto of, Never too late to discover, the SRT launched on stardate 202510.06. This marks the first time an SRT was formed during an expedition. Welcome to STARFLEET, ensigns!

The ambitious newcomers' first submission for the Hubble Expedition was on October 3. Sam noted the details in the team's log: "Baseline image of the night sky and the stars visible from my back porch in Grove City, OH | iPhone 13 Pro Max." No filters were used.

A Waxing Gibbous Moon made an appearance over the skies of Region 1 on October 5th. Sam and Brea observed and took a picture, with Sam noting in their log: "I've been impressed with the results Sarah Holloway from the USS Kitty Hawk has been getting with her Apple iPhone 14 Pro Max and decided to try the Nightcam app she has been using and an old gooseneck microphone stand with a heavy base in hopes of getting a more stable image."
Despite reports of the janky setup, Ensigns Sam and Brea managed to capture a really neat image of the Moon

Using an image enhancement tool on their ZWO Seestar S50 telescope, the McClanahan ensigns captured M42, aka the Orion Nebula *(this page)*. In addition, they also captured a stunning image of the lunar surface with their Seestar telescope *(see p10)*.

Home to more than 3,000 stars, M42 is located in the Orion constellation and visible to the naked (middle star in Orion's sword) due to being so bright. Their shot of the Moon reveals many of its most iconic regions and craters like Mare Imbrium (Sea of Showers), Oceanus Procellarum (Ocean of Storms), Copernicus, Archimedes, and others. Mare Serenitatis (Sea of Serenity) is partially obscured by the darkness of space. Just southeast of there under the cloak of total darkness is the Mare Tranquillitatis (Sea of Tranquility), the site of the Apollo 11 landing.

To echo FCAPT Barton's sentiments from earlier, this expedition crew did a stellar job compiling so much valuable data to share with the fleet and the rest of the world. I can't thank our mission specialists enough for their hard work and I hope you find ways to sport your PEP-2 mission patch with pride.

As for my contribution to the Hubble Expedition, I wasn't able to do much due to inclement weather for many nights in a row, along with how busy things got helping reorganize the STARFLEET Diplomatic Corps during October and November. But I will leave you all with one final photo of the Moon that I took some years ago.

This was taken in December 2017 through the lens of a massive observatory telescope at Rowan University's Ric and Jean Edelman Planetarium. Although attendance was for an assignment in my college environmental science class, I had never seen the moon like that before, so clearly. Years later, I find myself still in awe at what I saw through the telescope that night. And with the Artemis II launch just around the corner, it seemed like the Hubble Expedition was the perfect way to share images of our lunar neighbor, and the wider universe.

Never stop exploring and being curious.

Archer's Pathfinders After Action Report

Away Team Mission Date 2511.15

Mission Location:

NJ State Planetarium, Trenton NJ

Mission Event: Science Under the Stars

Presenter:

Joshua Shterenberg, Princeton University

Mr. Shterenberg (pictured left) is a graduate student in the physics department of Princeton University. More specifically, he is a cosmologist. Cosmologists study the universe on a grand scale. From the cosmologist point of view, galaxies or clusters of galaxies are pinpoint objects.

His opening slide had the title of his talk, "The Big...What?" His aim was to talk about The Big Bang and the Big Bang Theory and newer theories to the origin of the universe. Before his formal talk, he engaged the audience with the picture on his title slide, challenging them to find his favorite star. With some coaching, we eventually identified the area in the photo where it was. His favorite star is Arendell, named for an elf who turned into a star in the Lord of the Rings story. It is the oldest known star.

His formal talk contrasted The Big Bang with the Big Band Theory. One being the event, which is truth is a concept, while the other is the theory surrounding the event. This was postulated in the 1930s.

We know that the universe is expanding. When we observe the universe, we can only see back so far. Physicists call this the horizon, much like the horizon on the ocean. As the universe expands, the horizon changes, so the very distant part of what we can see is moving away from us right now.

What we can see, which is about 380,000 years old is the Cosmic microwave background, (CMB), felt to be the afterglow of the Big Bang, or a relic of the radiation that permeated the early universe when it cooled down to allow individual atoms to form, and allow light to travel freely. The universe before this was hot, like the core of a star. (as an aside, he mentioned that if we want to study the universe in this state, we can reference the conditions in the core of the star). The hot universe consisted of first ionized plasma, charged by electrons and photons, then non-ionized plasma, as it cooled. The universe continues to cool.

He highlighted problems with the Big Bang as it relates to known physics concepts. Sometime in the 1980s a new theory was postulated, called inflation. Inflation states that the universe is expanding and expanding at an accelerated rate. This theory solves a lot of the physics problems of the Big Bang, but causes problems of it's own with known physics.

One predominant theory, which is his thesis project, is called the Big Bounce; where the universe expands and contacts. This theory solves problems of inflation, and the problems it creates are being worked on

today. (Oddly enough, his thesis advisor was one of the original proponents of Inflation, and is now it's biggest critic.)

He stopped several times to take questions which often lead him into side discussion, but also had him go back to his talk, as the question related to something in his lecture coming up.

He concluded his talk with a slide that had a notation for further reading. One was a book by Afshordi and Halper called, Battle of the Big Bang. Also listed was a website called bouncingcosmology.com

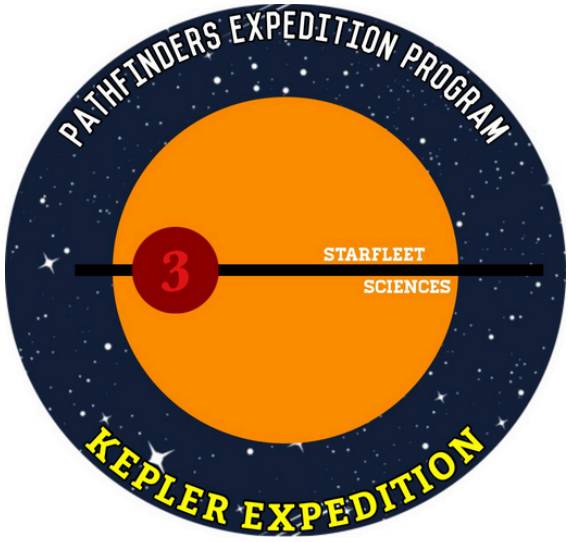
There were several questions at the end, culminating into a discussion of dark matter and dark energy. During the entire talk, he would mention things, these in particular, and would state he's not going to talk about that. Clearly, one hour did not do the topic justice, but was just enough for everyone to understand. Dark matter and dark energy seem to be the forces at play in the expansion of the universe. He didn't get much into the

explanation here, other than to say that this may be what stops the universe from going into “heat death,” where the universe cools and cools to the point that gravity isn’t strong enough to attract objects together, and the universe essentially “stops”.

One interesting aspect of the talk was he mentioned two things about gravity that are not well known to non-physicists, are that gravity does not always attact, it can repel. The other was in response to a question. He held his arm out to his side. As it wasn’t moving, the forces keeping it up must equal the forces pulling it down.Those forces are gravity, pulling it down, and the actions of nerves and muscles, which is essentially electromagnetism.As one can raise the arm higher, electromagnetism is a much more powerful force than gravity.

The next Science Under the Stars talks are Dec. 6, where one of the planetarium engineers will talk about the recent meteor showers, and Dec 14, when Dr. Jacob Hamer, Asst. Curator for Planetarium Education, will talk about how climate relates to space.

CAPT Stephen Vetrano, Asst. Team Leader, Archer’s Pathfinders
USS Challenger NCC-1676-D



Coming February 2026.
Recruitment begins January 10.
LTJG Vince Ceraso
Expedition Leader

Glaringly bright: LED headlights

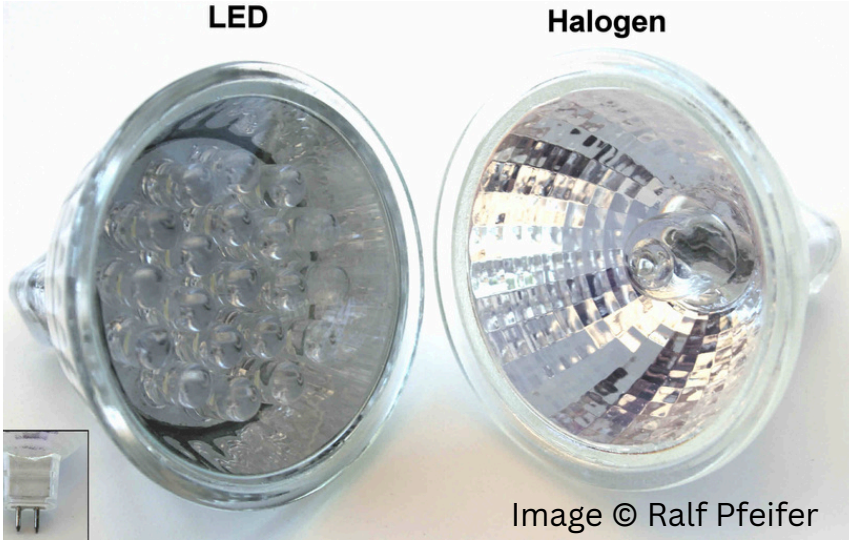
By LT David Lyons, Chief Science Officer, USS Ronald E. McNair, R1

LEDs are not light bulbs, but instead are a light emitting diode (an electronic component). Halogen bulbs are a filament that emits light in 360 degrees. LEDs emit light in only one direction, but also with an intensity that is consistent at every angle. This is why most people view halogen lights as inferior: the lens focuses the light in a beam with less light directed to the left and right of the center beam, referred to as 'dark spots.'

As an LED emits light there are no dark spots so it is perceived by the eye with equal intensity. Most drivers complain about LED headlights because of their pure white light, sometimes with a bluish tint. Halogen lights are more yellow in color, though some produced by Sylvania known as 'Silver Stars' have a blue tinted glass to more closely mimic the white light of LEDs. Because of halogen's more yellow glow, they are much easier on the eyes of drivers while the pure white tint of LEDs are more irritating to the eyes, likely also contributing to complaints about glare and the call for the banning of LED lights.

Probably the biggest cause of light glare that offends drivers at night (besides how high from the ground they are mounted on trucks and SUVs) is when drivers remove halogen bulbs and replace them with aftermarket

LED bulbs. This creates a problem because the car's headlight assembly and reflector are not designed to accommodate the design and shape of the LED fixture, nor the way that the LED emits light. This causes a misaligned light beam pattern to occur, sending light in directions that are not safe towards other cars. An example of this would be low beam settings that still put a lot of light 30 feet in the air, shining into trees or 2nd/3rd floor windows of the neighbor's house.



Aftermarket LEDs are actually illegal in every country when they are installed in a car that was not designed for their use. This includes the USA as there are no regulations regarding their usage by the NHTSA (National Highway Traffic Safety Administration). Any products not regulated by NHTSA are not legal on US roads, which is why cars used the old sealed beam lights until 1985, when Ford Motor Company challenged the government and won, allowing the aerodynamic design of headlights to be first used on the 1986 Ford Taurus. The argument was successful especially because the aero lights allowed greater fuel efficiency for the cars to meet CAFE standards for miles per gallon requirements.

The UK government has begun studying LED lights due to overwhelming public complaints about excessive light glare. In the U.S., some car experts, such as the American Automobile Association (AAA), say there's no evidence of glare from LEDs. Since the use of LED headlights is so new, few detailed studies have been conducted and some experts suggest that it is extremely difficult to scientifically determine 'glare.'

On a related issue, there is some evidence that LED light is harmful and causes injury to the human retina.

Source material:

What's the story with headlight glare?

https://magazine.northeast.aaa.com/daily/life/cars-trucks/whats-the-story-with-headlight-glare/

Dark Spots and Shadows in LED Headlights

https://youtu.be/8B20jDirO6c?si=xYAEg-xvRFrc_E3z

Light-emitting-diode induced retinal damage and its wavelength dependency in vivo

https://pmc.ncbi.nlm.nih.gov/articles/PMC5313540/

Who is Mara?

Star Trek: Day of the Dove

In November of 2024 I was finishing up the 200 level courses at the Klingon Warrior Academy. With encouragement from GEN Larry French, KWA's Director, I was ready to attempt my first 300 level SFA course. I decided to profile two Klingon women, Mara and Grilka. This is my interpretation of Mara's story, dedicated to the memory of GEN Larry French.

LT Janet 'Hopper' Livingston, ISS Kidd

Mara is a female Klingon descended from those infected with the Klingon augment virus. She is the wife of Commander Kang, and Science Officer on his battle cruiser.

As a female Klingon, Mara would be expected to be physically and emotionally strong, and confident in her abilities. She has been called a calming influence on Kang, helping him consider all options instead of

acting impulsively. As Kang's wife and a Science Officer, her reputation and the respect of the crew would be of utmost importance.

In Day of the Dove, an alien entity influences humans and Klingons to engage in physical combat so it can feed off the anger, hostility, hatred, and violent intentions of the combatants. Beneath the rage lies the fear each species has of the other.

Mara's actions under the control of the entity are not what one would expect of a Klingon. It's uncertain if her augment heritage affects her behavior in this episode, as males similarly affected were able to achieve roles as captains and crew of starships in the Klingon Defense Force, with some becoming Dahar Masters.

Mara expresses her fears to Kang as soon as she is beamed aboard the Enterprise and learns they are prisoners. "What will they do to us?" she asks. She mentions death camps and that they would be tortured for their scientific and military knowledge.

While the Klingons are detained on the Enterprise, Kang makes plans to take over the ship. Mara tells him "they will kill us before we can act." She also seems to admit defeat when she says "we are 40 against 400."

Mara appears to be frozen with fear when Chekov assaults her, barely struggling against him.

These examples show the difference between how the entity seems to affect males and females. The males are driven to physical aggression, while Mara doesn't move beyond fear into any physical action. Uhura is the only other female who might be affected by the entity. She exhibits a brief flare of frustration and anger about not understanding what was preventing communications outside the ship, but otherwise she maintains composure.

The entity doesn't appear to completely control everyone all of the time. This permits some of Mara's confidence and bold Klingon personality to occasionally emerge. When Klingons take over engineering, Mara stands beside her husband as his crew cheers their victory. Her stance radiates pride and a quiet dignity.

Although the Klingons have taken control of engineering, Mara is unable to change the ship's course so they can return to Qo'noS. Kang wants to interrupt the ship's power at the main life support couplings. Mara identifies that location on number 6 deck. With a nod from Kang, she purposefully leads the way to deck 6, followed by another Klingon.

Chekov attacks them on their way to deck 6. Mara tries to resist Chekov's unwanted advances, but she seems unable to summon the strength to fight back. After Kirk subdues Chekov, he demands Mara take him to Kang for a temporary truce until they can defeat the entity. Mara's expression appears to indicate she is considering the truth in what Kirk says, but she doesn't agree to act.

Mara learns more about the entity as she listens to Kirk, Spock, and Bones converse amongst themselves. Bones mentions several unusual medical events such as near-fatal wounds rapidly healing and abnormal brain waves. Spock determines the entity wants everyone to remain alive, and observes the entity's life-energy increase or decrease depending on the available emotions. Mara even witnesses the manifestation of the entity, yet when Kirk contacts Kang to convince him to cease all violence she shouts a warning to Kang that Kirk was setting a trap. Again, fear rules her actions.

Kirk, Spock, and Scott discuss the severity of their situation as Mara listens. She holds herself steady as she learns she will be used as a hostage in order to gain Kang's cooperation. Kirk tells Kang that Mara has five seconds to live unless Kang accepts the offer of truce. Mara lunges forward, perhaps to speak to Kang. Kirk stops her, and Kang is willing to let Mara be killed. She glances down in defeat when she hears this, and is stunned to learn Kirk was bluffing.

Kirk explains to Mara that their survival depends on mutual trust and teamwork. As a Klingon, she only knows survival as hunting and taking what is needed. However, she agrees to take Kirk to Kang and support Kirk's bid for peace.

Mara finds the ability to fight the entity's influence and trust herself, her instincts, and her judgment. She stands before Kang and his crew to defend Kirk and insist they listen to him. As Kang raises his sword to strike Kirk, Mara bravely steps between them. Disgusted by the thoughts of what the humans might have done to Mara, Kang throws her across the room. Mara doesn't flinch or falter as she tosses Kirk a sword, knowing the battle between Kirk and Kang is inevitable. Still, she eventually finds her voice, calling for the fighting to stop. When Kang ignores her, within hearing distance of the Klingons holding her, she mutters 'fool.'

Kirk brings the fighting to an end, and explains to Kang how the alien is feeding off them. Mara makes a passionate plea to her husband to believe Kirk. Kang takes a moment to consider her words and those of Kirk, then tosses away the sword he was holding. Mara smiles in genuine relief, having played a pivotal part in defeating the entity.

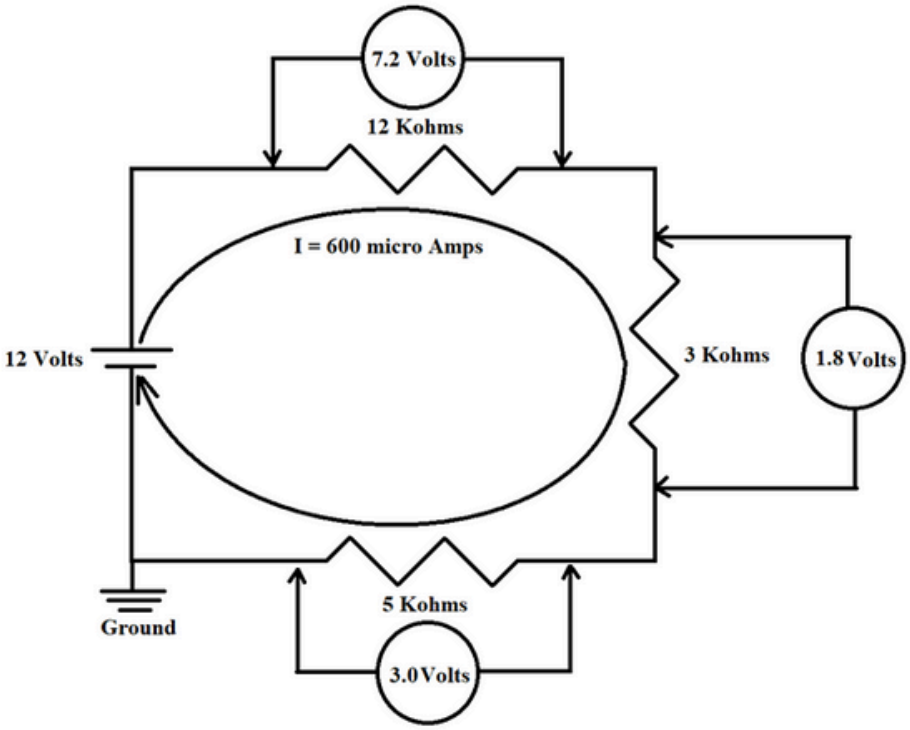
References

Day of the Dove ~ *Klingon* ~ *Kang* ~ *Mara*
Klingon Medical Manual
Day of the Dove recording
A Woman's Insecurities by Dr. Arletha Lands (book)
The Gift of Fear by Gavin de Becker (book)

The basics of electrical engineering: Series DC circuit

By LT COL Michael Stelzer, USS Oklahoma, R12

A series circuit has the same current flowing through each of its components. A simple series circuit is depicted below.



In this configuration, the current flowing into the entrance of the first component is equal to that which flows from its exit, which is the same current that flows into the entrance into the next component, and so on until the electrical current flows back to its source.

The ground symbol represents the return path for electrical current and is generally omitted for simple circuits.

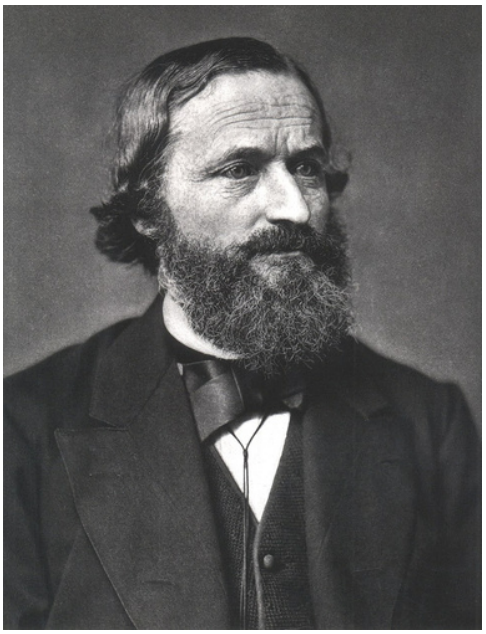
To derive the electrical characteristics of this circuit, we apply Ohm's Law multiple times. Since this is a series circuit, we can compute the total resistance of the circuit by merely summing the resistances around the closed loop (electrical path from the positive to negative terminals of the battery).

Thus, **R_{TOTAL} = 12 Kohms + 3 Kohms + 5 Kohms = 15 Kohms = 15,000 ohms**.

Then, to calculate the current, we again apply Ohm's Law as **I = V/ R_{TOTAL} = 12 Volts/15,000 ohms = 600 micro Amps = 0.0006 Amps**.

This current maintains its same value as it flows through each of the resistors in this circuit.

Finally, to calculate the voltage drop across each resistor, we continuously apply Ohm's Law, **V_R = I*R. Thus, $V_{12Kohms}$ = 0.0006A * 12,000 Ohms = 7.2V, V_{3Kohms} = 0.0006A * 3,000 Ohms = 1.8V, and V_{5Kohms} = 0.0006A * 5,000 Ohms = 3.0V.**

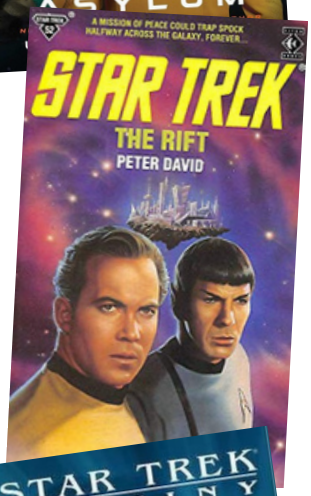


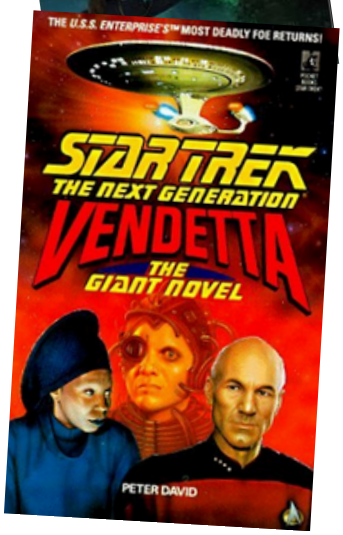
Notice that the sum of the voltage drops across each resistor is equal to the supplied voltage of the battery (**$V_{BATTERY}$ = $V_{12Kohms}$ + V_{3Kohms} +V_{5Kohms}**).

This principal is known as Kirchhoff's Voltage law and always applies around a closed loop.

Pictured left:
Gustav Robert Kirchhoff (1824-1887)

Science Fiction





Since 1968, *Star Trek* has spawned hundreds of spin-off books and many thousands more fan fictions starring our favourite characters and ships. We want to celebrate some of that creativity in the pages of the *Event Horizon* by sharing some of our members' stories set in the *Trek* universe.

In this issue we feature the next part of the story started last issue by FCAPT Rahadyan Sastrowardoyo; following the story of Nancy in the 20th century and the crew of the *USS Ride* in the 24th century. The story will continue in the next issue!

If you have a story that you have written, ideally with a scientific discipline featuring in the narrative, then we would love to print it!

Please send any contributions to
sfsci-eheditor@sfi.org

WWWDD

by FCAPT Rahadyan Sastrowardoyo, USS Challenger

Dedicated to Cullan Colgan, Gabrielle Casianan, and Kayla Sastrowardoyo, in the hopes that your futures will be brighter.

ACT ONE: March 24, 1929:

Author's note: Proper names in this section are rendered in Dutch orthography (e.g., oe for u, j for y, dj for j, etc.), used in the colonies of the Netherlands until about 1947. Place names are what natives of the Dutch East Indies would have called them in 1929.

Bandung, West Java, Dutch East Indies: Soetedjo hand-rolled another cigarette and smoked it to the end as he awaited the birth of another child, his 13th. He and his wife Sujati counted the daughter who had died during the so-called Spanish Flu pandemic 11 years ago, but not others. He had an excellent memory, but some memories best kept at a distance. Soetedjo himself was not a religious scholar or an imam, but he felt certain that the souls of unborn children went to Jannah.

It was just after sunset. The midwife and an attendant were in another room of their house with Sujati. Only half of his children were at home; the rest were scattered around Java. His eldest son, Soenario, was practicing law and working to make Java, Sumatra, and the other territories of the Indies an independent nation, entirely free from Dutch rule.

The previous October, Soenario had attended the Second Youth Congress in Betawi and had met Dina, a young woman from Manado in Minahasa. She was equally as fervent in the desire for their people's freedom. Sadly, Sujati didn't approve of Dina because she was not Javanese, but Soetedjo thought well of her and looked forward to their upcoming wedding.

Nearly thirty years ago, Soetedjo had defied his father's wishes to succeed him as a surveyor and instead had gone to the civil servants' school in Magelang. Eventually he was named a wedono, the liaison between the local rulers and the Dutch colonial government, but that was long ago: he had been expelled from his office for a simple mistake. Soetedjo was too proud to take another job, so the family subsisted at the margins.

Soetedjo was 50 years old, and Sujati, nearly nine years younger at 41. This new baby was a surprise. If it was to be a male, as a fortune teller had predicted, he would be named Soemarsongko, a poetic word meaning "moonlight." As a rule, for their children, Soetedjo favored names related to light because they gave him and his wife great joy, despite the hardships of having so many.

It was late in the day for visitors, but a man approached the house and hailed Sutedjo from the street. The gaslights showed he was dressed in a European-style suit jacket and button-down shirt, but a dark-colored sarong. Soetedjo was dressed similarly. He went up to the gate and let the stranger into the front yard. “What may I do for you?” Soetedjo said calmly though he prepared at the same time to defend himself and the household with the walking stick he often carried.

“Nothing, Raden Mas,” said the stranger with a slight smile, addressing Soetedjo by his title. He spoke in High Javanese with an unfamiliar accent. “But I have something for you and your family, in celebration of your new son.”

“How do you know it’s a son?”

“I just know,” said the stranger. And he proffered to Soetedjo a small leather bag with what turned out to be a large sum in Dutch guilders, new-looking bills and coins. Soetedjo counted. Enough to pay for the midwife’s services and medications, as well as food for his family for several weeks.

“Who are you?”

“My name is … Hartono, a distant member of keluarga besar Sastrosentono.” The stranger knew that the clan was large enough that not every member had met each other in person. And Hartono was a fairly common name -- while one meaning was “treasure,” it could also mean “wealthy” or “prosperous.”

“Why are you doing this?”

“Does it matter?” replied Hartono. He seemed uncomfortable with the question.

ACT TWO: September 23, 1979

Danny put on a recording of a show on the television in the living room. It was of a new science-fiction series, one of two that had premiered that month. Nancy looked up from the Encyclopedia Brown book she was reading, and asked her 14-year-old brother, “Whatcha gonna watch?”

“Something called Galaxy Quest. It started last night. No idea if it’s good or not,” was Danny’s reply.

Nancy put a bookmark in the place where she had left off, and watched it with her brother. It was a Sunday afternoon. Papa was in his study, trying to figure out the new house computer; Mama was napping; and Tim was out somewhere. Benjie came upstairs from his room not long after the show started. Danny asked him if he wanted to restart the recording. Benjie shook his head.

There was only one actress in the main cast, and her role was that of the computer officer of the starship NSEA Protector. Nancy was only six, but she thought the character, named Tawny Madison, was ridiculous. “She doesn’t do anything but repeat what the computer says,” she complained. “Anyone could do that, and it’s stupid that they make the only girl do it.” “Stupid” was a word that Nancy used often when she also meant “unfair” and “inappropriate.”

She wondered if her girl cousins had watched the show and what they all thought. Mellie, Molly and their parents were away for the day, and Nancy wished Carrie lived closer than California. Her handwriting was still crooked, so she thought of asking one of her brothers to help her write Carrie a letter.

Benjie and Danny agreed with her opinion about Tawny Madison. “Maybe they’ll give her something more to do in the next episode,” said Ben.

“I hope so,” said Nancy. “Why can’t she be a doctor or a scientist, or something more important like on Battlestar Galactica?”

“I think this is just the pilot,” offered Danny. At Nancy’s questioning look, he clarified, “A first episode that the producers sold to the network to see if they would want at least half a season of episodes. I hope the writing gets better. We’ll see.”

“I wonder what Tim will think,” said Benjie. “She looks like she’s his type.”

“What’s a type?” asked Nancy.

“Well… I mean she looks like someone he’d fall for.”

Nancy rolled her eyes. “I think Tim could do better. He likes smart girls. Tawny doesn’t seem very smart.”

“Tim likes things other than smart,” said Danny with a smirk.

Benjie, who was 10 but in some ways better-mannered, shot his older brother a warning glance. “What do you mean?” asked Nancy.

Danny realized his mistake and blushed a little. “Never mind, Nance. That was really dumb of me.” Their parents were always worried that they would all grow up too fast; the kids’ television viewing habits were carefully monitored and only Tim, who was 16, was allowed an access tag for the house computer.

And while they had stopped going to church not long after moving to Long Island, Nancy’s brothers had adopted the practice of watching their language and never telling dirty jokes anywhere near their sister.

ACT THREE: October 21, 1991:

Nancy didn’t expect to come home from college as often as she did, but she missed her family more than she’d expected. Fortunately, she had her own car – her mom’s old Ford Sentinel with some aftermarket improvements -- and the travel time between their home in Suffolk County and New Haven was no more than 75 minutes, thanks to the Leeb. The Joseph Lieberman Bridge, connecting Long Island to Connecticut, had only been completed a few months previously. Otherwise, she would have had to take the ferry, the Lindsay Tunnel in Nassau County, or take the long way around much closer to the city.

It had been a good weekend. Tim and his girlfriend had come in from Queens, Danny and his wife from Virginia, and Ben from New Jersey. Mama and Papa had ordered a lot of food from a Filipino restaurant in Ronkonkoma, but Tim had also brought Indonesian food – including *daging rendang*, Ben’s favorite – from a restaurant in Elmhurst near his apartment. It was only the second time that the family had met Tim’s

girlfriend. She was a bit shy at first, but fit in well, and Tim seemed happy. Danny and his wife had some wonderful news to share: they were expecting a baby girl, due in April.

As was often the case, Nancy was returning to college with lots of leftovers. It was Sunday afternoon, just before the rush for those returning from their weekends. She drove east on Sunrise Highway to Route 112 and then turned north. Parallel to 112, she could see the beginnings of the new north-south light-rail system that was planned to eventually supplant personal vehicular traffic. (Ben's oft-told joke about there should never be flying cars, because the drivers on Sunrise proved that most people could hardly drive in two dimensions popped into her head.)

The new S-phone she'd been given for high school graduation was in its interface on the dashboard. Nancy didn't use the earpiece so she could focus on driving, and the phone was set to Do Not Disturb anyway. She didn't anticipate any urgent calls.

Before too long, Nancy was at the on-ramp to the Leeb just past Main Street in Port Jefferson. Apparently, a lot of other college students had had the same idea to return to Connecticut earlier on a Sunday.

As she crossed Long Island Sound on the bridge, Nancy kept her car on manual control. An autonomous-drive mode had been retrofitted into the Sentinel, but she was wary of using it. Outside, she could see the wind farms that had been operating in the Sound for years.

Nancy’s car radio was set to a news station but the talk program she’d been listening to was briefly interrupted by a commercial for the K-chip, a satellite-based device that one had implanted in the body. The K-chip was a combination of telephone, 24/7 medical telemetry, transponder for emergency services, and remote internet-access terminal. It had just been released to the public. Nancy wasn’t sure she wanted to be that connected.

About 4 p.m., Nancy pulled into the parking lot near her dormitory. A light on the dashboard showed that the lot's induction grids were charging the car's battery. The food from home had been packed into foil bags in a large tote, and she carried that as well as her backpack of freshly-laundered clothes up the front stairway and into her room.

ACT FOUR: late December, 2284:

Captain’s Log, Stardate 7999.1:

The USS Ride is transporting classified cargo to Starbase 10. Per Starfleet Command’s direction, the cargo was divided among three different ships. None of the crews were informed of which two ships. Science Officer Michaelsen has calculated our ETA as 96 hours from now, at warp factor 5. Our course will bring us close to the Romulan Neutral Zone and thus are proceeding with caution.

Personal Log, Stardate 7999.1:

Ansible crystals were first synthesized in the 22nd century, reverse-engineered from the technology of a still-unknown species. A new form of ansible crystal has recently been developed by a civilian firm in concert with Starfleet Communications. It is hoped that these will improve long-range subspace communications by as much as 25 percent.

Captain Rebecca Gallaudet turned off the log recorder and put on her uniform jacket. It was shortly before alpha shift. While smaller Federation ships often conducted business less formally than the capital ships, Gallaudet believed in dressing for the job that you wanted. Her ambition was to be the commanding officer of a heavy cruiser like the Enterprise, or maybe even a dreadnought or carrier.

She briefly touched the frame of the holo on her desk. It was of Gallaudet and Captain Corinne Morgenthau of the Tereshkova, on a vacation in upstate New York on Earth.

A classified mission meant no personal comms for the duration. Their practice was to send each other a glyph that meant “Can’t talk now. I love you” on a little-used subspace frequency. Neither had the same definition of love: Rebecca was inclined to believe it was about intent, while Corinne believed it was about responses.

On the Ride, the officers’ quarters were in an outer ring on Deck One, so Gallaudet walked a few meters to the bridge at the center. The communications officer announced “Captain on the bridge,” as she assumed station from her gamma-shift counterpart.

First Officer Thevin had been the officer of the deck on the overnight shift. He was already standing next to the command chair; Gallaudet took her seat. “On course at warp factor 5, Captain,” Thevin reported. Atypical for an Andorian, Thevin was totally bald. “Long-range sensors show no disturbances. Subspace channels are quiet except for normal traffic.”

“Thank you, Commander.”

The mission continued without any undue incidents. The Ride’s chief engineer reported that they needed to replenish deuterium at the starbase. And the crew would be given several days’ shore leave once they arrived. Gallaudet and the senior officers were glad for a quiet mission.

ACT FIVE: January 2, 1980:

Nancy asked Tim to help her type out a letter to Gwen DeMarco, the actress playing Tawny Madison on Galaxy Quest. The character had not gotten any better as the season progressed. Nancy offered suggestions on how Tawny could be a better role model for viewers her age. “Why not give her a few shows off and say she’s training for another job on the Protector?”

When Tim suggested to Nancy that the production company may have already filmed the entire season, she thought for a moment and suggested instead the position of scientist and landing-party leader for the second season, though there had not yet been an announcement as to if the series would be renewed.

Nancy and her brothers enjoyed more the other science-fiction show that had debuted four months previously, *Buck Rogers in the 25th Century*. Tim enjoyed old pulp fiction from the 1920s to the 50s, and had read the 1928 novel that the series was based on, Philip Francis Nowlan's *Armageddon 2419 A.D.* The new series was a modern take on the book, and the newspaper comic strips, movie serials, and even a 1950's TV show, that followed.

Nancy's favorite character on the show was Colonel Wilma Deering, played by a former model as Tawny Madison was, but (in Nancy's opinion) a much better character. Like Lieutenants Athena and Sheba on *Battlestar Galactica*, Colonel Deering was a fighter pilot. Danny drew his sister some pictures of Deering's starfighter and tried his best to draw Colonel Deering as well. Nancy pinned the pictures to the bulletin board in her room, and was very happy.

A few weeks after she'd sent the letter to Gwen DeMarco, Nancy received a large manila envelope in the mail. Inside was a letter that read: "Dear Fan, We at *Galaxy Quest* are overwhelmed by the viewer response to our show, and unfortunately cannot write individual letters back to our fans. Thanks so much for your comments and suggestions, and especially for watching!!!" and a black-and-white photograph of the actress at the computer on the Protector's bridge. It was signed "Your friend, Gwen DeMarco (Lt. Tawny Madison)." Nancy was disappointed and annoyed; but while she didn't hang it up, she kept the photograph and form letter in a drawer of her small desk.

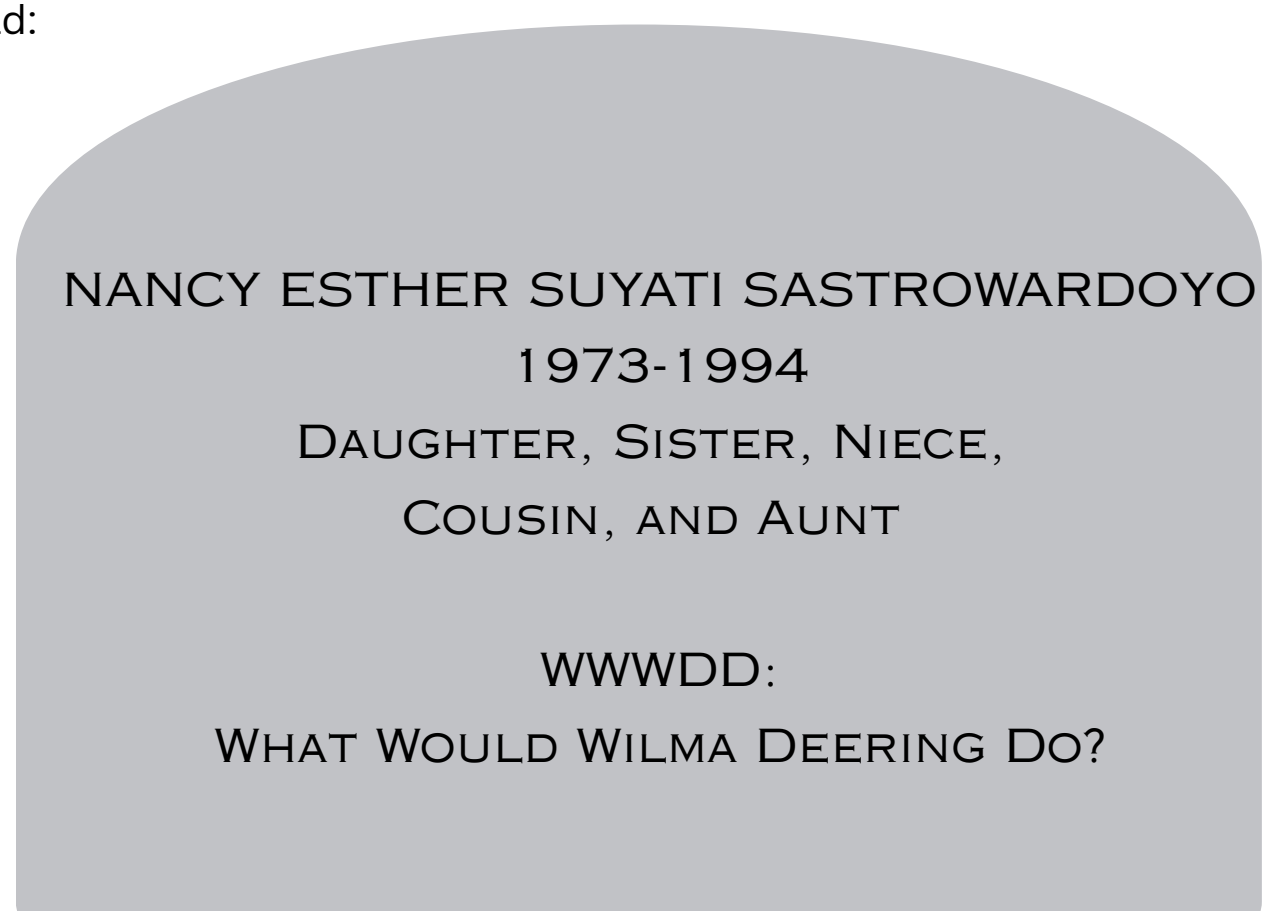
ACT SIX: 1994:

Nancy's funeral was a simple graveside service, attended by her parents and brothers, and members of the extended family that still lived in the United States and Canada. A separate memorial was scheduled for weeks hence, with her friends from high school and college as well as some former teachers and instructors to be in attendance.

Tim had retreated into his usual shell, not crying but stoic. Danny had focused on his own family; he didn't know how to tell his daughter where her Tita Nancy had gone. Ben was quiet but went off to cry often; and his girlfriend and her family were also there to support him.

The three brothers helped their parents with the arrangements. There would be no religious person serving as an officiant, and Papa and Mama were too shocked to serve as such. It was ultimately decided that Tim, Danny, and Ben would each eulogize Nancy briefly.

Months later, Nancy's gravestone was installed at Pinelawn Cemetery. It read:



EPILOGUE: Stardate Unknown

Via the Guardian of Forever, Aurora de la Cruz and three other people watched Nancy's funeral. Two were Starfleet officers from the 23rd century who had gone back nearly three centuries to make sure the timeline proceeded as it should, but it meant that Nancy had to be a casualty of the Eugenics Wars. The fourth person was the director of the Federation Department of Temporal Investigations, Dr'en Kolbert. Kolbert looked to be about 60 years old in Earth-human terms, but the truth was that he was far older.

The older of the two Starfleet officers, who had called himself "Purnomo" for the mission to 1994, and "Hartono" in 1929, asked Aurora, "Are you okay?"

"No," she said quietly. "I don't think I ever will be." She had recently discovered she had the ability to flashback to the lives of previous incarnations, not always direct ancestors. Aurora didn't have complete control over the ability, and it was so far unknown who else had manifested it. A classified inquiry had been made to Memory Alpha for the personal logs and secure files of different people, both within and without Starfleet, but it was tedious work and ongoing. A separate inquiry to Temporal Investigations was only a bit more fruitful.

The Starfleet officer that had called himself "Jantang" while in 1994, said, "I'm sorry."

"I know," she replied. "I think I have more to find out about my past lives."

To be continued in "The Desperate and the Broken-Hearted"

The science of Santa

By CAPT Pam Kingsley
USS Mercia, R20

"Any sufficiently advanced technology is indistinguishable from magic."

- Arthur C. Clarke

Being in the middle of the festive season as I write this, I was wondering how Father Christmas could manage to get around all the children in the world in one night. Was it at all scientifically possible? Is Santa, in fact, a technologically advanced being rather than the magical elf of stories?

Father Christmas starts delivering presents on Christmas Eve, typically appearing between 9pm and midnight in each local time zone, according to NORAD, which tracks his journey each year. He uses the time zones to his advantage, giving him up to 34 hours to make all the deliveries. There are about 800 million children in 200 million homes around the world, but it's not as simple as making one simple loop around the planet. Arnold Pompos of Purdue University calculated that, Father Christmas would have to travel a total of 160,000,000km (99419390.758miles) – further than the distance from the Earth to the Sun.

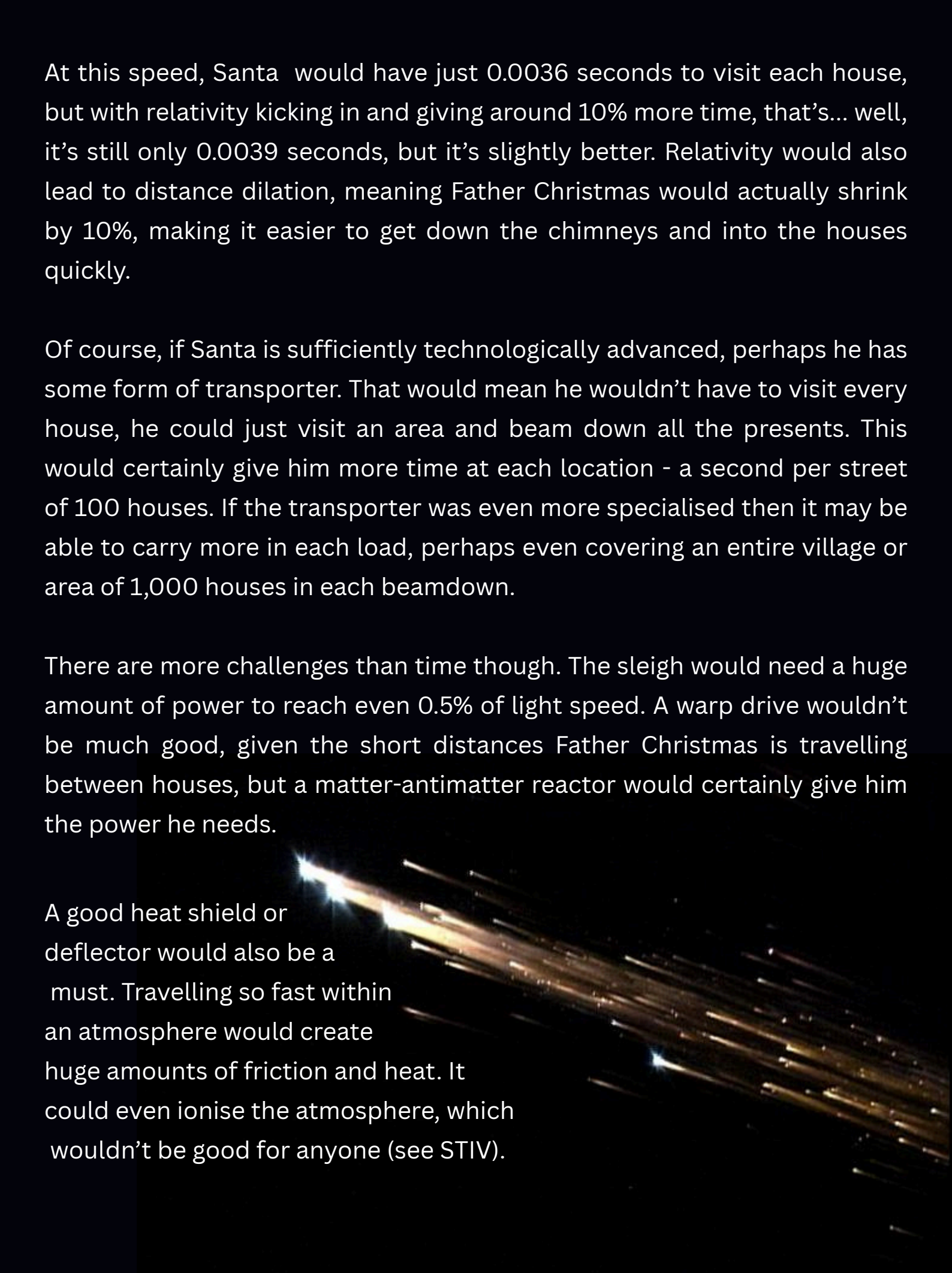
Working out the speed he needs to travel means dividing the distance by the time, giving a rounded speed of 4,705,882kmph or 2,924,100mph. This is just 0.436% of the speed of light (1,079,252,848.8kph/670,616,629mph), but even so, it's fast enough for Father Christmas to be affected by relativity.

At this speed, Santa would have just 0.0036 seconds to visit each house, but with relativity kicking in and giving around 10% more time, that's... well, it's still only 0.0039 seconds, but it's slightly better. Relativity would also lead to distance dilation, meaning Father Christmas would actually shrink by 10%, making it easier to get down the chimneys and into the houses quickly.

Of course, if Santa is sufficiently technologically advanced, perhaps he has some form of transporter. That would mean he wouldn't have to visit every house, he could just visit an area and beam down all the presents. This would certainly give him more time at each location - a second per street of 100 houses. If the transporter was even more specialised then it may be able to carry more in each load, perhaps even covering an entire village or area of 1,000 houses in each beamdown.

There are more challenges than time though. The sleigh would need a huge amount of power to reach even 0.5% of light speed. A warp drive wouldn't be much good, given the short distances Father Christmas is travelling between houses, but a matter-antimatter reactor would certainly give him the power he needs.

A good heat shield or deflector would also be a must. Travelling so fast within an atmosphere would create huge amounts of friction and heat. It could even ionise the atmosphere, which wouldn't be good for anyone (see STIV).



European Space Agency's 'Jules Verne' ATV-1 re-entry in Earth's atmosphere over Pacific Ocean.

Perhaps the answer to this would be phasing technology of some sort? Or boosting the power of that present transporter even more so the sleigh doesn't have to go so fast.

The other theory we could chase is that Father Christmas somehow uses transwarp, breaking Warp 10, which Tom Paris told us makes it appear as if you're everywhere all at once. While this would make delivering present very fast, it would also be very complicated making sure that the right presents went to the right children, and that's without working out how to turn Santa back into a humanoid after become a salamander.....

Let's stick with a superpowered sleigh, shall we?!

References:

NORAD

BBC Science Focus - How fast would Santa Claus have to fly to visit every child in the world?

Mission Astro - Santa's Speed: How Physics Explains His Christmas Eve Journey

Star Trek Voyager, Threshold

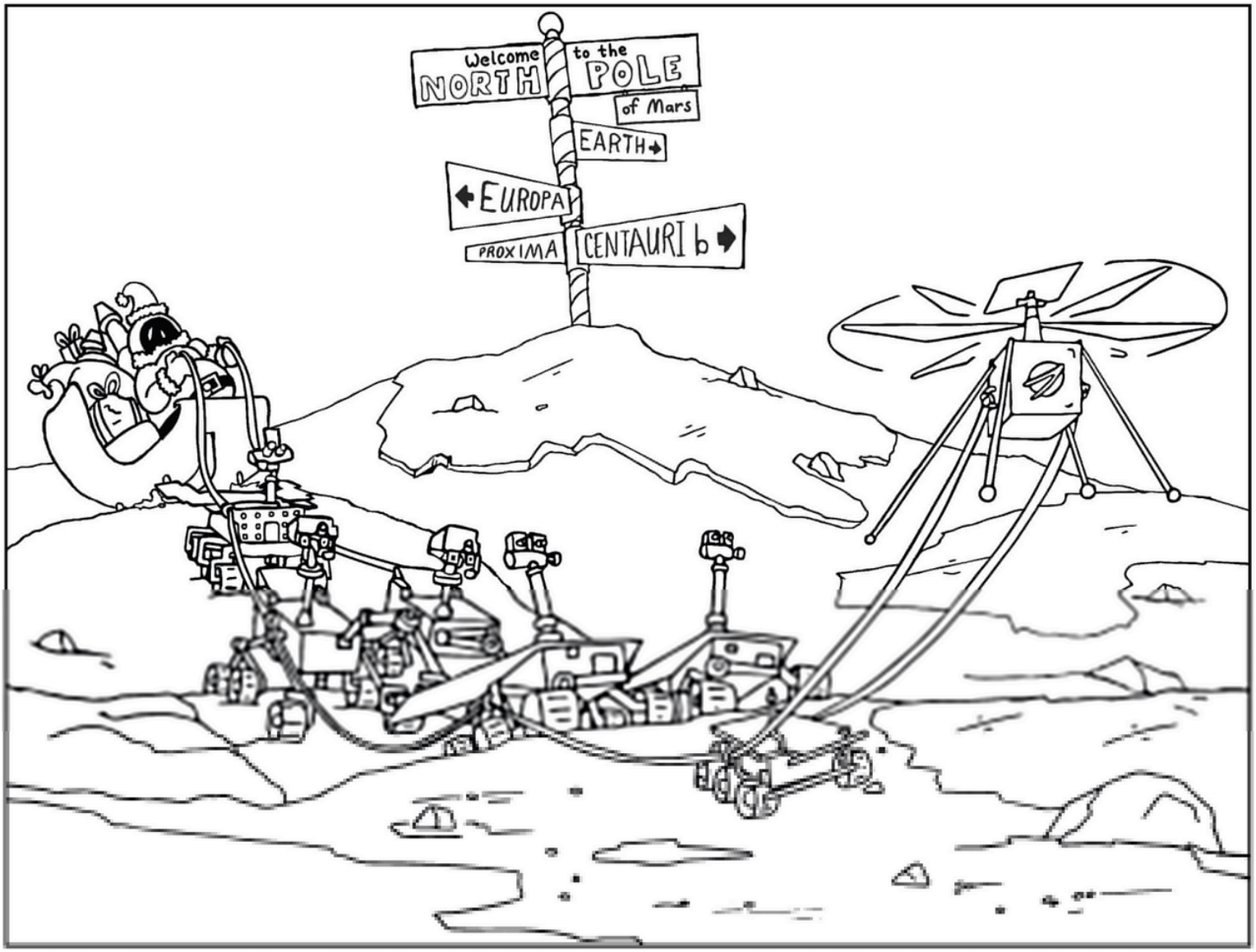
CADETS ONLY PAST THIS POINT!

Solve the anagrams. Use the circled letters from the words and unscramble them to complete the answer to the puzzle. Each circled letter is used only once.

SCISINA		COISUYRIT	
YRAEVGO		AFYOLRGDN	
EIPNORE		GVKNII	
OPAOLL		RNEOWSZOINH	
LELOGIA		AEERVEPERSCN	
SYESSLU			

Radioisotope thermoelectric generators produce the power to enable *these* to explore our solar system and beyond.

B T

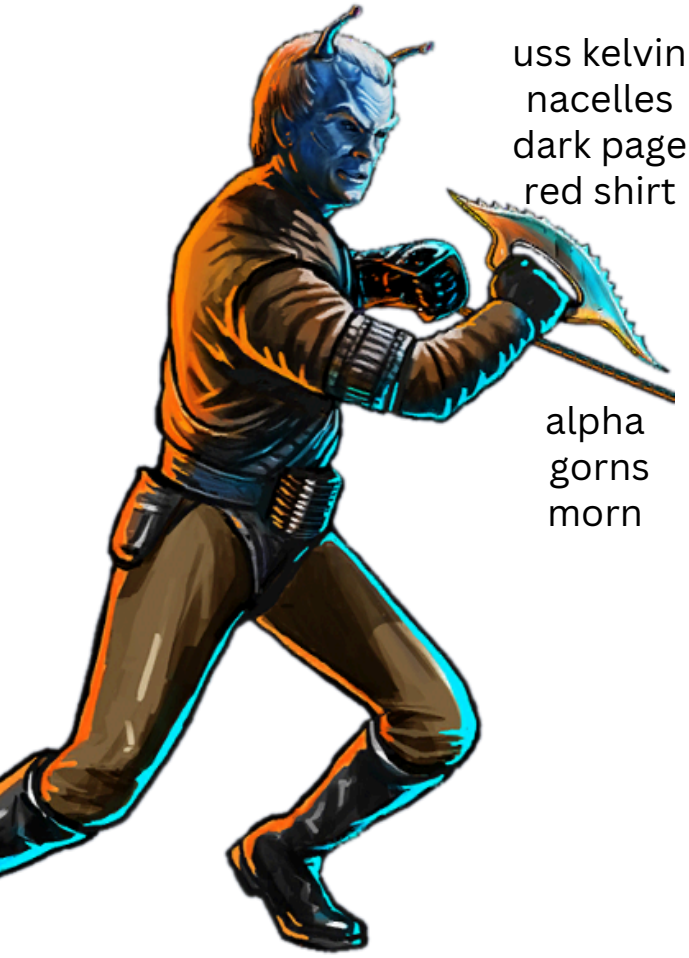


Santa and his rovers: Sojourner, Spirit, Opportunity, Curiosity, Perseverance, and Rosalind Franklin! With Ingenuity leading the way.

Wordsearch

Created by LTCDR Diane Ripollone using Word Search Generator

h t w w l l i r k k s z y e g a p k r a d z d
c v t r i h s d e r o n i v l e k s s u i g e
f r e d r o c i r t p b s n a i s s a d r a c
r y r s n a t l e d d n a d c k v s n r o g g
d o q r a i r o d n a y i y n o i r u t n e c
e t e e l f r a t s g k k h a b o r g a l o s
l e s r e v i n u r o r r i m s t r n h r d r
t u n o i t u t i t s n o c f n h a r p d e a
a o n o z i r o h t n e v e t s n i o l f p e
v f l o c u t u s o f b o r g b x b m a c r y
e l u i m n m t e l l a r i t e s b r a u o r
g q a g t s u n k a t s e x j e m m u d r t e
a u n m b n i c u z g a n a c e l l e s m u t
w u p h a s e r r i f l e r r e t i p u j s s
f s e t i n e h t i r s c q m j f n p a m u e
u m i r r o r m i r r o r j n d z v j l c f y



uss kelvin
nacelles
dark page
red shirt

alpha
gorns
morn

mirror universe
kobayashi maru
locutus of borg
event horizon
constitution
mirror mirror
phaser rifle
cardassians
borg
krill
andoria

yesteryear
tellarites
centurion
delta vega
ithenites
tricorder
tsunkatse
starfleet
deltan
jupiter
torpedo

Answers to anagrams on p37:

ROBOTIC SPACECRAFT

Radioisotope thermoelectric generators produce the power to enable these to explore our solar system and beyond.

USLYSSES

GALILEO

PERSEVERANCE

APOLLO

NEW HORIZONS

PIONEER

VIKING

VOYAGER

DRAGONFLY

CASSINI

CURIOSITY

51 Pegasi b stands out among the first exoplanets discovered. It's about half the mass of Jupiter, with a star-hugging orbit that means its "year" is only 4.2 Earth days! It is the first planet confirmed to orbit a Sun-like star, and it ushered in a new class of planets called "Hot Jupiters": massive planets orbiting extremely close to their stars.

What colors would light up the first exoplanets discovered?

NASA's Exoplanet Exploration Program. Jet Propulsion Laboratory, Pasadena, CA.

exoplanets.nasa.gov

www.nasa.gov

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