Issue 8. April 2026

Event Horizon

The magazine of STARFLEET Sciences

2024 STARFLEET Newsletter of the Year



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Are you ready for Project Earth?!

Is terraforming possible?

The size of the universe

Get involved with citizen science

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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**

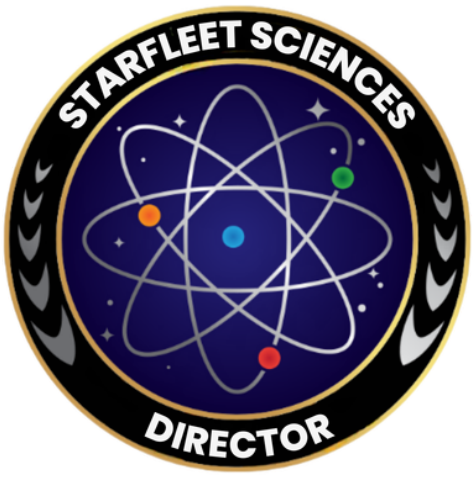
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Cover image: From *The City on the Edge of Forever (TOS)* - Captain Kirk shows Edith Keeler the stars.

"We are just an advanced breed of monkeys on a minor planet of a very average star. But we can understand the Universe."
— Professor Brian Cox

From the Director's Office

Greetings!



April 22nd marks World Earth Day, an event that originated in the U.S. in 1970 to bring awareness about the serious problems of pollution and threats to wildlife. Just ten years later, the U.S created the Environmental Protection Agency and passed several major environmental protection laws as did other nations around the planet. By the 1990s, April 22nd had become known as World Earth Day and is now globally celebrated around the world.

Here we are 56 years later and the health of Sol III is still under serious threat, facing climate change, mass extinctions, habitat fragmentation, the loss of coral beds, and so much more. It can be overwhelming to think about let alone figure out what we can do to help. But STARFLEET never shies away from danger and our Auxiliaries have once again teamed up to bring you Project Earth, STARFLEET's celebration of World Earth Day. Your mission? To participate in a clean-up effort within your area, join us at our Summit and Science Fair at Gather Town to build our community, share ideas about how we can make a difference, hear great presentations, and celebrate this beautiful and unique planet we call home. Consider hosting a watch party with your chapter or SRT and make a day of it. More details are in this issue of the Event Horizon. Protecting Sol III is one of the most important missions we can undertake. Will you join us?

To the stars!

Barb Barton

From the Editor's Desk



Welcome to another issue of the *Event Horizon*!

This issue is packed full of articles from down to Earth electrical engineering, to exploring the stars and speculating on terraforming worlds within our solar system.

We're looking forward to Project Earth on April 25 and the surrounding events. If you missed it last year, try to find time to drop in this year. We have a packed schedule of events, all online, or you can organise or join a clear up in your local area as part of the wilderness clean up part of the event.

Don't forget to send in any pictures you have of science-related events you go to, activities with your chapter, or photographs of the natural world that you think other members would enjoy looking at.

We are always looking for content for future issues, whether fact or fiction. Please send contributions to **sfsci-eheditor@sfi.org** - I acknowledge every contribution received so if you don't get an email back within a few days, please send it again.

Until next time,

Captain Pam Kingsley

Deputy Director of STARFLEET Sciences & *Event Horizon* editor

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: April 18 11am EDT/3pm GMT
“From Analogs to Artemis: Preparing for Space by Understanding Ourselves”
Speaker: Sharife Gacel, Analog Astronaut and Founder of the Blue Marble Project



This talk explores how Earth-based simulations shape the future of human spaceflight. The talk recaps life inside HI-SEAS, highlights the global collaboration of the World’s Biggest Analog, and concludes with Artemis II updates, showing how lessons from analog missions inform the human challenges of returning to the Moon.

Sharife Gacel is an analog astronaut and has completed two missions; HI-SEAS in Hawai‘i as the Medical Officer, and in Mission Control during the World’s Biggest Analog in Vienna.

Sharife is the founder of the Blue Marble Project, a multidisciplinary initiative that integrates psychology, space science, art, and public outreach with the mission of Exploring Space, Inspiring Earth.



Coming soon: April 25 2pm EDT /6pm GMT
“Preserving the Final Frontier: The Need for Darkness and a Natural Night”
Speaker: Patrick Sommer, DarkSky International

Artificial light at night is one of the newest and fastest growing forms of human created environmental pollution. Deployment of lighting without care or responsible planning has created an environment where, in some locations, more than 90% of the people living on the ground can no longer see the full glory of the night sky. This robs us of desperately needed sources of awe, wonder and inspiration, and even more worrisome has serious negative impacts on human physical, mental, and economic health. And while bad for us, the effects on the rest of nature are considerably worse.

We will raise shields as we explore the causes and impacts of light pollution from artificial light at night, discuss with engineering the numerous solutions already available, and even conduct sensor sweeps as we learn about the critical role citizen science plays in helping restore a natural night.

Patrick Sommer has been a lifelong enthusiast for the night sky, space exploration, and science fiction. He represents DarkSky International as a delegate in the Fargo, North Dakota area. Patrick currently works full-time for the North Dakota Air National Guard as a Command Post, Command and Control supervisor and training manager.



Coming soon: May 16 11am EST/3pm GMT
“Artificial Intelligence and leadership”
Speaker: Major Sam McEvoy, Royal Corps of Signals, British Army

Picard had Data; today's leaders have AI. This talk explores how artificial intelligence is reshaping leadership through the lens of leadership theory and real-world practice and how AI can help us make better decisions, lead more effectively, and think more critically.

We'll look at whether we want to see an AI sitting in the captain's chair, or whether that remains a human-only endeavour...at least for the moment.

Major Sam McEvoy is a serving UK Army officer and lifelong Trekkie - and a member of STARFLEET - who is currently based in Europe. A devout technophile, his career has included such areas as Space, Artificial Intelligence, and Quantum Computing for UK Defence.

Sam is a returning speaker to the Sol series. To watch his previous talk Protecting the Final Frontier: The Role of UK Space Command, **click here.**

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**

Would you be interested in having Sol talks available another language? If so, please let us know what language you require.

On Saturday, April 25, 2026, STARFLEET Auxiliaries will host the second annual STARFLEET Project Earth – a multi-event celebration inspired by World Earth Day!

Join us as we honour Terra (Sol III), the cradle of the Federation and home to our Fleet's finest beings—both humanoid and non-humanoid alike! Gather up your fleet mates and beam into a nearby park to conduct a clean-up mission, join us online for the first ever Project Earth Science Fair in Gather Town, and of course, the Project Earth summit will be hosted on StreamYard and will be full of excitement, exploration, and celebration of our planet Earth.

Project Earth Event - April 25, 2026

Date & Time (Eastern)	Date & Time (UTC)	Project Earth Event - April 25, 2026
10:00 am ET	2:00 pm UTC	Project Earth Science Fair opens at Gather Town!
12:30 pm ET	4:30 pm UTC	**Project Earth Summit Begins** via **Stream Yard!**
12:30 pm ET	4:30 pm UTC	**Auxiliary Introduction Videos**
1:00 pm ET	5:00 pm UTC	**Nature/Environmental Games Showcase** by SF Tactical!
2:00 pm ET	6:00 pm UTC	**Sol Speaker Series** - Patrick Sommer - DarkSky International
3:15 pm ET	7:15 pm UTC	*15 Minute Break*
3:30 pm ET	7:30 pm UTC	**Project Earth Greetings** from the Fleet and More!
4:00 pm ET	8:00 pm UTC	**Kahoot Science Trivia**
5:00 pm ET	9:00 pm UTC	**Conservation Mission: Save the Planet** - a video showcase conservation projects around the planet
7:00 pm ET	11:00 pmUTC	Project Earth Science Fair opens at Gather Town!

To register and for more information visit sciences.sfi.org/project-earth/

Who are your Science Stars of 2025?

Are you a CO? Are you an RC? Are you a Regional Science Liaison? If you are, then you have a superpower you may not be aware of! **At the IC this year we will be announcing the winners of Science Officer of the Year, Sciences/Sol Liaison of the Year, Chapter of the Year, and Region of the Year, and you can submit nominations!**



The deadline for submission is July 15, 2026, so if you believe you, your chapter or your Region deserve to be recognized for outstanding achievements in the name of science, then send a list of those accomplishments to your CO, RC, or Regional Science Liaison.

Learn about all the available Performance Excellence Awards offered by STARFLEET Sciences, and how to submit a nomination, here: **https://sciences.sfi.org/performance-excellence-awards/**

SCIENCE OFFICER OF THE YEAR

This prestigious annual award is given to a Science Officer of a chapter of STARFLEET who has shown consistent dedication and excellence in promoting the sciences within their Chapter or Region. Their conduct has been exemplary and represents the highest ideals of Star Trek.

Nomination by: CO, Regional Science Liaison or RC

SCIENCES/SOL LIAISON OF THE YEAR

This prestigious annual award is given to a Regional Sciences or Sol Liaison who has shown consistent dedication and excellence in promoting the sciences and the Sol Speaker Series within their Chapter or Region. Their conduct has been exemplary and represents the highest ideals of Star Trek.
Nomination by: CO or RC

CHAPTER OF THE YEAR - Sciences

This annual award recognizes the Chapter in STARFLEET that has shown consistent dedication and excellence in promoting the sciences. This Chapter serves as an inspiration to all of STARFLEET in its contribution to promoting educational opportunities and activities for its members.
Nominations by: Regional Science Liaison or RC

REGION OF THE YEAR - SCIENCES

This annual award recognizes the Region in STARFLEET that has outstanding participation by its Chapters in the area of Sciences. This Region serves as an inspiration to all of STARFLEET in its contribution to promoting education and opportunities to its members in the area of the Sciences.
Nominations by: Regional Science Liaison or RC





When we look up at the night sky, we rarely ask ourselves the question that may be the most unsettling of all:
where does the Universe end?

In my previous essay, I searched for our place within this cosmic whole. Now I take one step further. For once we realize how small we are, another question inevitably arises:
how vast is the space in comparison to which we are so infinitesimal?

Numbers Too Large for the Human Mind
According to the current state of science, the diameter of the observable Universe is approximately **93 billion light-years.**
A figure that is disorienting in itself.



A light-year is the distance light travels in one year: nearly 9.46 trillion kilometers. When we say that a distant galaxy lies 10 billion light-years away, we are in fact stating that the light reaching us today began its journey at a time when the Earth itself had not yet been born.

And here, the first crack appears in the walls of human thinking:
we are looking not only across space, but also back through time.

The Size of the Universe – How Far Does the Human Gaze Reach?

A thought from the edge of infinity

By Lt. Gábor Nagy; R9 Sciences Liaison

As Edwin Hubble recognized:
“The Universe is not static, but expanding — and the farther away a galaxy is, the faster it is receding from us.”
This expansion also means that there are regions forever beyond our reach. Not because we are too slow, but because space itself is expanding faster than we could ever travel through it.

Voyager: A Grain of Dust Sets Out

This is where humanity enters the story.
In 1977, **Voyager 1** was launched — a probe barely larger than a small car.
Today, it is more than **24 billion kilometers** from Earth and has become the first human-made object to cross the boundary of the Solar System: the heliopause.



It is a breathtaking achievement.
But it is also mercilessly honest.

On a cosmic scale, Voyager’s journey is scarcely more than a step beyond the garden gate. Even the nearest star, Proxima Centauri, lies more than 4 light-years away — a distance that would take Voyager tens of thousands of years to traverse.

And yet, this tiny probe carries humanity’s message with it.
A golden record bearing sounds, images, and music. A quiet but sincere message sent into the cosmos:
“We were here. We thought. We asked questions.”

Here, the words of Carl Sagan gain particular weight:
“Somewhere, something incredible is waiting to be known.”

The Edge of Infinity — or the Absence of One

The most difficult question still remains:

does the Universe even have a boundary?

Science approaches this question cautiously.

It is possible that the Universe is finite yet unbounded, like the surface of a sphere.

It is possible that it is far larger than its observable portion.

And yes, it is also conceivable that we live within one bubble of a multiverse.

At this point, speculation inevitably enters — along with a touch of science fiction.



The *Star Trek* universe never claimed to possess all the answers. But it did assert one fundamental idea: **curiosity is a moral obligation.** Warp drive, intergalactic travel, unknown civilizations — all are parts of a thought experiment:

what if we refused to stop where we are now?

Here, science fiction is not an escape from reality, but a compass.

Returning to Ourselves

And finally, I return to where I began.

When one contemplates the size of the Universe, it is easy to get lost in it. Easy to feel insignificant.

But for me, the opposite happens.

If, within such a vast, ancient, and indifferent cosmos, there exists a species that asks questions, that sends music among the stars, that refuses to be satisfied with mere existence — then that alone already carries meaning.

What matters is not how big we are.
But whether **we choose to look up.**

And as long as there are people who, from a dark garden, a cold observatory, or a quiet night of astrophotography, continue to ask the question:

“What else is out there?”
— the Universe will never be silent.



Algol – the Demon Star

By Comm. Michael Lewis, USS Potomac, R1.



Known to Arab astronomers in antiquity, they gave Algol, or Beta Persei, the name 'al Goul,' meaning 'the Demon' or 'the Evil One,' since it seemed to wink at them from time to time. The English astronomer John Goodricke is credited with determining that Algol has a definite dimming and brightening period.

In 1881, an American astronomer, Edward Pickering, presented convincing evidence that Algol is really two stars, even though they just look like one star to us. In this star system, one star is brighter than the other. Like clockwork, the dimmer star passes in front of (eclipses) the brighter star. When it does, it causes them to appear much dimmer than usual. We can actually see this change with our eyes. Stars like these are called 'eclipsing variables.'

The two stars are separated by 57 million miles, about the same distance Venus lies from our Sun. But where Venus takes 225 days to orbit the Sun, the stars of the Algol system complete their orbit in about 69 hours. The duration of the eclipse lasts about eight hours. That means you can watch the entire eclipse within a single night, if you look at the right time!

On most nights, you will be able to see Algol either get brighter or dimmer, but you won't see the full eclipse. Since the dimming or brightening takes only 4 hours, you should check the brightness of Algol every 20 to 30 minutes to follow the change. Alpha Persei and Delta Persei are located nearby: use them for comparison because they don't change in brightness like Algol does.

Citizen Science with SciStarter

By Comm. Michael Lewis, USS Potomac, R1

In real life I am a SciStarter Ambassador for SciStarter.org. I help other people participate in citizen science projects.

On 17 February 2026, I attended a Zoom meeting, Acts of Science: Connected Info Session for Hosts & Facilitators. This meeting prepared me for Citizen Science Month in April.



I registered for a webinar that Dark Sky International is cohosting on March 19 for the preparation of plans for the International Dark Sky Week (April 13 - 20). I added a celebration of IDSW to my plans for the celebration of **Astronomers Without Borders** Global Astronomy Month in April (Global Astronomy Month - Astronomers Without Borders, 2024).

DarkSky International's collaboration with SciStarter lets me use initiatives like Globe At Night to measure light pollution and participate in other night-related research efforts. Light pollution affects plants, animals, and humans on Earth, according to research results (DarkSky, September 2024). Two proposals before the Federal Communications Commission involve SpaceX and Reflect Orbital. SpaceX plans deployment of a large network of AI data centers into low Earth orbit. Reflect Orbital plans a system of mirrors on satellites that reflects light down to Earth. The impacts of this technology in low orbit around the Earth may not be welcome in some places (Staff, March 2021).

References

1. Global Astronomy Month - Astronomers Without Borders. (2024). Astronomerswithoutborders.org.
2. DarkSky. (2024, September 11). What is light pollution? DarkSky International.
3. Staff. (2021, March 29). New Study Finds Satellites Contribute Significant Light Pollution To Night Skies.

Is Terraforming possible - and is it a good idea?

By COL Jordan Reinleib, USS Britannic, R7

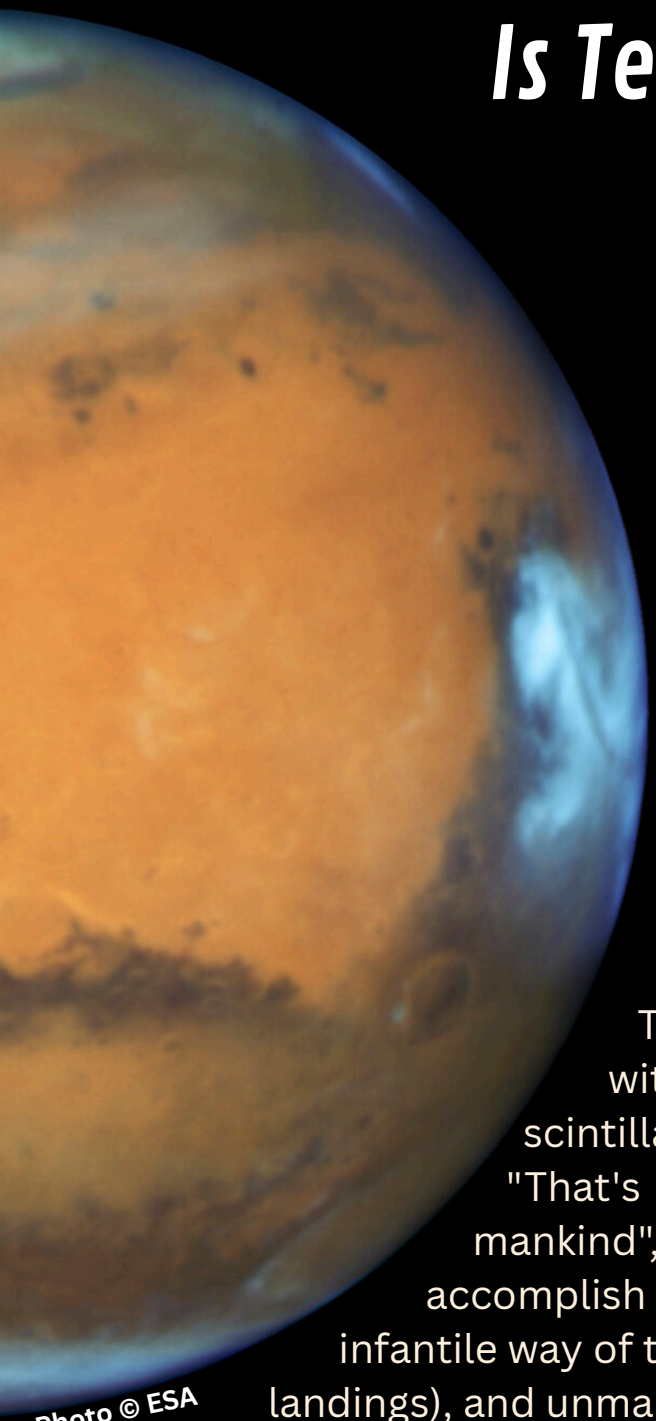


Photo © ESA

When we first forayed into space with the launch of Sputnik in 1957, the Space Age was born. In 1961 it made history when the first human Yuri Gagarin walked in space, orbiting Earth. This was followed by other historical milestones as the first unmanned probe landing on the Moon in 1968 followed by one of our most prominent milestones- The first man to set foot on an alien world in 1969.- JFKs dream brought to fruition.

To see humanity land on an alien world, replete with its unique features was intriguing, and even scintillating. When Neil Armstrong uttered the words "That's one small step for man. One giant leap for mankind", it truly epitomized us showing what we could accomplish as a species if we abrogated our primal and infantile way of thinking. Then between this (subsequent moon landings), and unmanned probes landing on Venus and Mars it was refreshing to bask as with the Moon in the panoramic diversity of different worlds to see how different and even antithetical they are compared to our own.

Each world is unique. Some are large, some are small, some red, some green, some multi-colored, some encircled by rings, some riddled with deserts, and so on. Terraforming in its broadest sense entails taking the chemical compositions of alien worlds and changing them so their end results mirror that of Earth, enabling us in theory to survive on them.

Venus is a noxious planet. Venus's atmosphere is predominantly comprised of carbon dioxide, with traces of nitrogen, sulfur dioxide, and ammonia. Its sky is yellowish, green, replete with sulfur dioxide and clouds comprised of ammonia. Venus's rains inundate its surface with sulfur dioxide. As such, its impacts beget vapors which are deleterious to life, earning meriting Venus the label "Earth's evil twin".

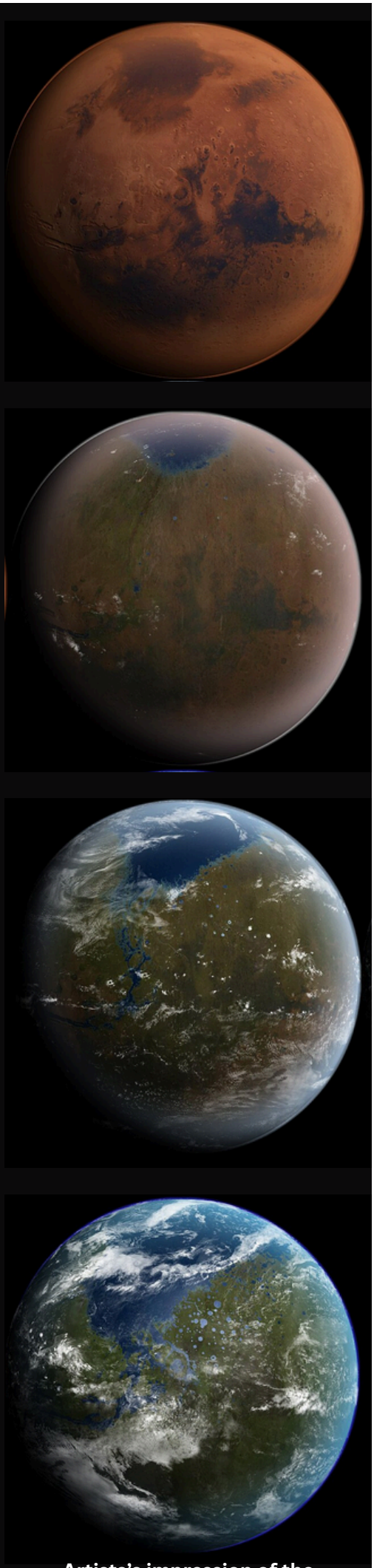
Despite being further from the Sun than Mercury, Venus is hotter, courtesy of its thick atmosphere trapping and encapsulating heat in a "runaway greenhouse effect." Venus is 92 times the temperature of Earth and hosts a milieu of volcanoes – some of which are active, and release lava and toxic gases – of which Maat Mons is the largest.

While the Russian probe Venera 7 able to descend to its surface and transmit images, it lasted all of 34 minutes before it was crushed by Venus's unrelenting pressure. To terraform Venus would require thinning its surface pressure temperature (cooling it) enough to allow for liquid water to envelop its surface. We clearly have our work cut out for us to bring this to fruition.

Venus’s atmosphere is comprised of sulfur and its surface has no water, and is bereft of oceans, rivers, and lakes. We would start with large scale chemical reactions or introduce microorganisms that contain water. If we can clear this hurdle, then it's incumbent on us to build and erect giant solar reflectors or shades in Venus’s orbit and reflect part of the sun’s rays away from Venus, thereby cooling it. This would, eventually, render Venus amenable to supporting life and habitation.



Photo © NASA Magellan



Artists’s impression of the terraforming of Mars © Daein Ballard

Mars is a trifle bit more tranquil compared to Venus. Mars's atmosphere is mostly reddish-pink courtesy of ferrous oxide particles suspended in its atmosphere and skies. Ironically though, Mars's reddish-pink skies are not it's natural color. When Mars's rusty particles dissipate, it's sky becomes akin to ours (blue with white clouds), but that's where the similarities end.

Mars's surface is one big desert resembling our Sahara, notorious for frequent and habitual sandstorms, and is home to Olympus Mons, a gargantuan volcano. Mars also has seasons.

Our probes have been able to land on Mars and continue to transmit information, giving us much information about the “red planet”.

Terraforming Mars would require thickening its atmosphere by extracting carbon dioxide from its atmosphere and combining it with flourine-rich compounds from Mars Valles. We could use Mariner’s solar reflectors, orbital mirrors and Fresnel Lens arrays (150m in diameter) to concentrate sunlight on its polar caps to accelerate sublimination.

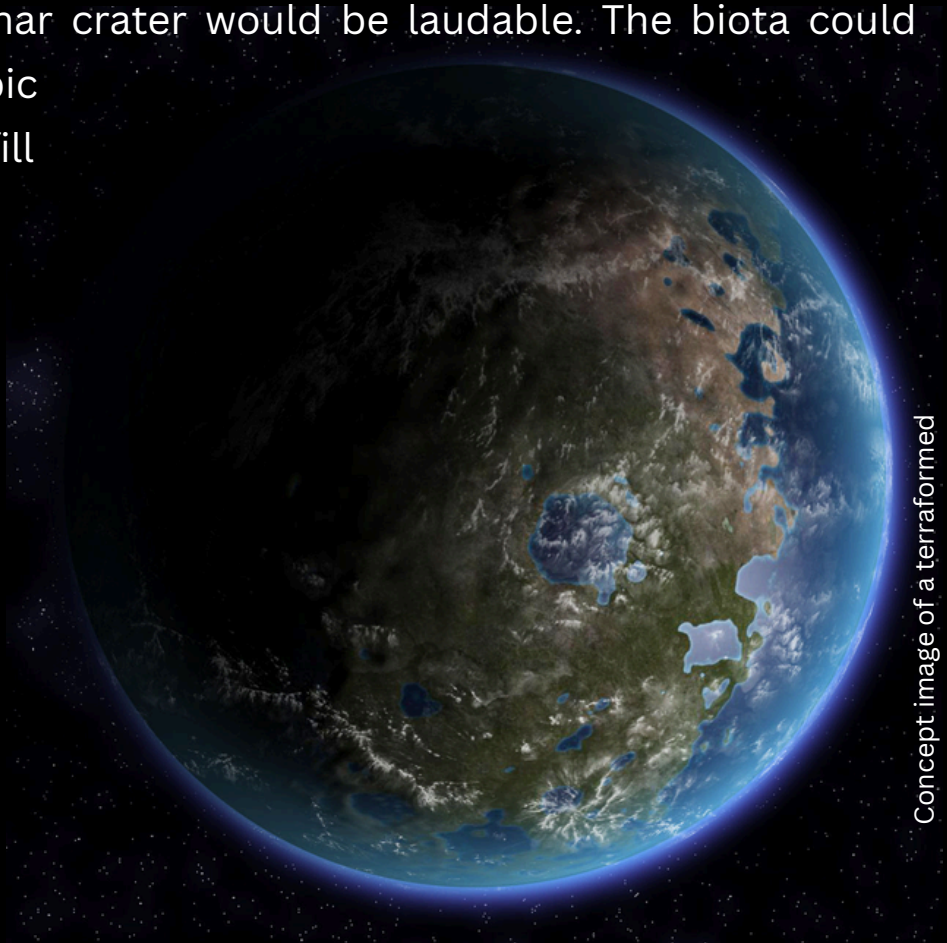
This would release Mars’s polar ice and import volatiles. Bodies of liquid water would beget rivers, lakes and streams. Releasing engineered greenhouse gases would warm Mars and accelerate the melting of its polar ice caps.

Then we have the Moon. The Moon is the ailen world we know the most about having visited it numerous times. The Moon is a gray world replete with craters, boulders, mountains and of course rocks. It has a regolith, which is a dusty outer body of soil, and a minutely thin atmosphere (exosphere), although it's merely inches thick which renders it impervious to the naked eye. To terraform the Moon would be formidably challenging.

We could capture comets that contain water ices and volatiles, and crash them into the Moon's surface. The comets would sublimate, dispensing these gases and water vapor to create an atmosphere. Liberated water would accrue on its lunar regolith to form natural gases. The problem is the Moons size is so small (1/6 of Earth) and thus have difficulty maintaining an atmosphere.

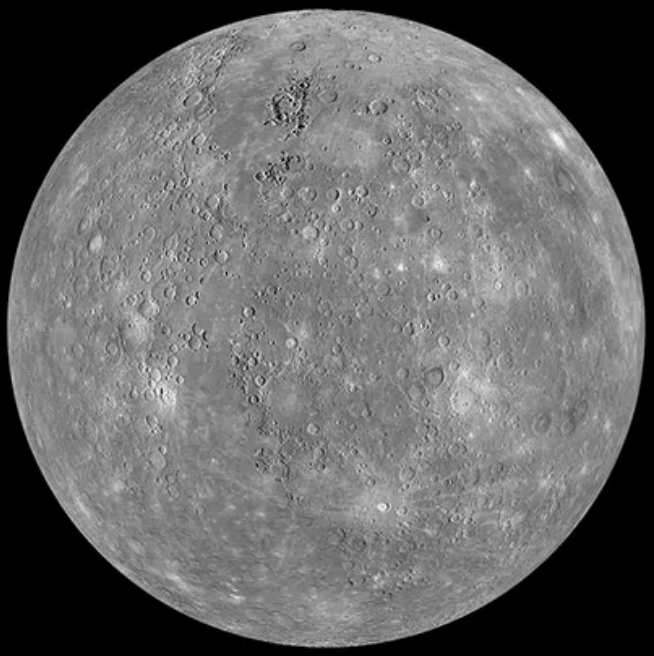
In lieu of that we would need a self enclosed structure with Earth-like gases to fill it. Bacteria would enrich its lunar soil. Next crushing lunar rocks could incur the process of lunar agriculture. This would release the elements necessary for life for us to inhabit it. We could then build an airtight dome, fill it with Earth-like plants, biota and others. Bringing water or recovering it from a lunar crater would be laudable. The biota could support life with microscopic plants, animals, fungi, and fill it with soil.

While these endeavors are theoretically possible, it would take decades, if not centuries or millenia, for the technology to become available to us.



Concept image of a terraformed Moon. © Daein Ballard)

Mercury is similar to the Moon with its craters, hills, valleys and mountains. Like the Moon, it has a very small atmosphere. Mercury has no seasons.



The difficulty with terraforming Mercury its low mass, making it difficult to hold on to any atmosphere. Indeed, any atmosphere built would dissipate in the solar winds.

Above: Mercury. Below: Pluto. Both © NASA

Pluto is the furthest planet from our sun. Despite Pluto being downgraded to a dwarf planet in 2006 by The Astronomical Union I'm still, for nostalgia's sake, referring to Pluto as a planet.

Pluto has a reddish-brown surface, valleys, plains and craters, frozen gases, and the heart-shaped Tombaugh Regio, named after its discoverer, on its surface. Its surface temperature is an average 44 kelvin (-229°C/-380°F).

The difficulty with terraforming Pluto is, like Mercury and the Moon, its diameter is so small its would be unable to hold an atmosphere, therefore you'd have to add to its mass to give Mercury enough gravitational pull to be able to sustain an atmosphere.



These endeavors are light years beyond our current technology

See next issue for Part 2: The gas giants, ice giants and other notable planetoids.

Science news from Region 1

2024 Region of the Year - Sciences

By Lt Janet Livingston, SFSCI Chief of Communications

Region 1's February report for STARFLEET Sciences was absolutely inspiring! I'm selecting just a few highlights from ADM Richard Heim's (Region 1's Sciences Liaison) detailed liaison report to share with you. If your Region is participating in science activities, make sure your Regional Liaison is aware of those. I will continue to recognize Regional science events in future issues of The Event Horizon. If your Region doesn't have a liaison, you may **submit your own Regional science article to The Event Horizon**. If you are interested in representing your Region as a Sciences Liaison, you may apply here: **https://sfi.org/vr/regional-sciences-liaisons/**

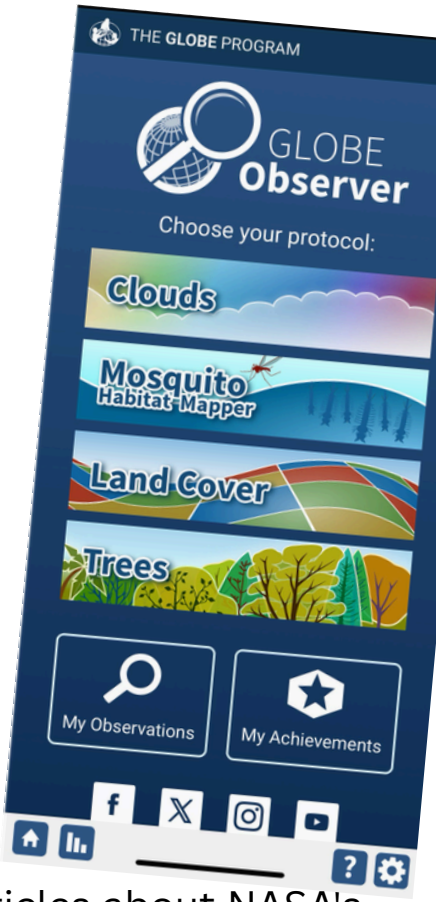
What's been going on in Region 1?

Assistant RDC (ARDC), Comm. Michael Lewis, as Administrator of Starfleet's Pinterest Program, pins items to Pinterest boards that show what is happening around the 'Fleet. For the period 5th Jan-4th Feb 2026, there were a total of 5319 impressions! The top five science boards were: Science-Related Events by Region, Incoming-Outgoing Spacecraft Near Earth, Weather by Region, Space Weather Forecast, and Geology by Region.

In February, Comm. Lewis forwarded to Region 1 CSOs info on CERN, Black History Month, STEM communicator Maynard Okereke, NASA TV events, Globe at Night/SciStarter star hunting steps, Europa ICONS (a STEM internship for undergraduate students), and Antarctic glacier science research discoveries.

Region One Sciences Education Resource Officer, Lt.Cmdr. Diane Ripollone, is CSO of the USS Kitty Hawk. In her Region 1 Sciences Education Resource Officer and STARFLEET Sciences Chief of Education roles, Diane kept the region updated on NASA's Artemis II test flight mission, and she is working with Kitty Hawk Science Department members and with other Region One ships to get them involved with STARFLEET Sciences activities.

As CSO, Lt.Cmdr. Ripollone reported that the Kitty Hawk's Science Department has seven members and that she is prompting all members to join STARFLEET Sciences.



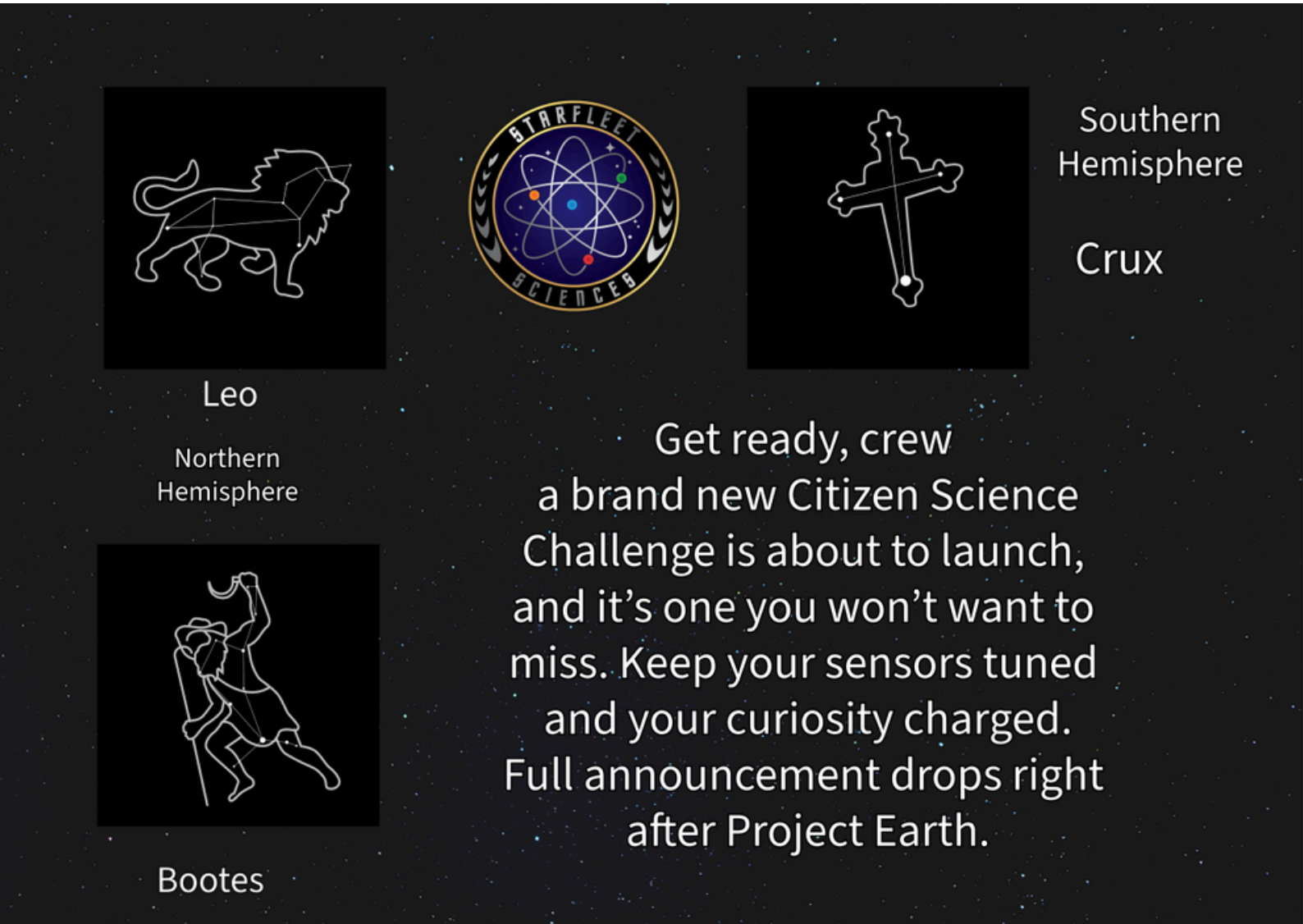
She adds, "Due to circumstances beyond our control, we had to cancel our participation in Astronomy Weekend. However, I attended with my Robotics team, and the event drew approximately 15,000 people. We are currently planning to host a table at Anime Con in Raleigh on March 14–15. Science will be represented, and we hope to use this opportunity to recruit new members.

“I am also participating in the PEP-3 activity with SRTs. Our next science initiative will be a Citizen Science project using the GLOBE Observer app. This will align with the upcoming challenge for the SFSci group.”

Lt. Tracy O'Quinn, CSO of Station Shelby, has posted articles about NASA's Artemis Moon mission and a breakthrough in research to treat pancreatic cancer on the ship's Facebook and Discord pages, created some slides for a chapter talk about meteors, and is planning a talk on interesting atmospheric and weather events.

Lt. Teresa Collins-T'Coll, the CSO of the USS Tanasi, reported some articles posted in the Science Department's Discord server and Facebook member page include: James Webb Space Telescope watches distant galaxies form farthest cluster ever seen in the ancient universe; watch NASA fuel up its Artemis 2 moon rocket in critical prelaunch test; Martian meteorite that fell to Earth is full of ancient water, new scans reveal; and impossibly powerful 'ghost particle' that slammed into Earth may have come from an exploding black hole — and it could upend both particle physics and cosmology.

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The basics of electrical engineering: Kirchhoff's Laws

By Lt Col Michael Stelzer, USS Oklahoma, R12

Kirchhoff's Voltage law states that the algebraic sum of the voltage sources and drops around any closed circuit is zero. To accurately prove this law, we first assign polarity around a closed loop. In the simple series circuit below, assign a positive polarity (+) to the longer battery terminal.

As the current flows in a clockwise direction through each resistor, we assign a positive polarity at the entrance to each component and a negative polarity (-) to each exit. The current finally returns to the source (the negative or shorter terminal of the battery).

These polarity symbols on each component illustrate the direction of current flow and voltage polarity across each component. When traveling from the negative to the positive terminal of each component, assign a positive sign to the sum. When traveling from the positive to negative terminal of each component, assign a negative sign to the sum.

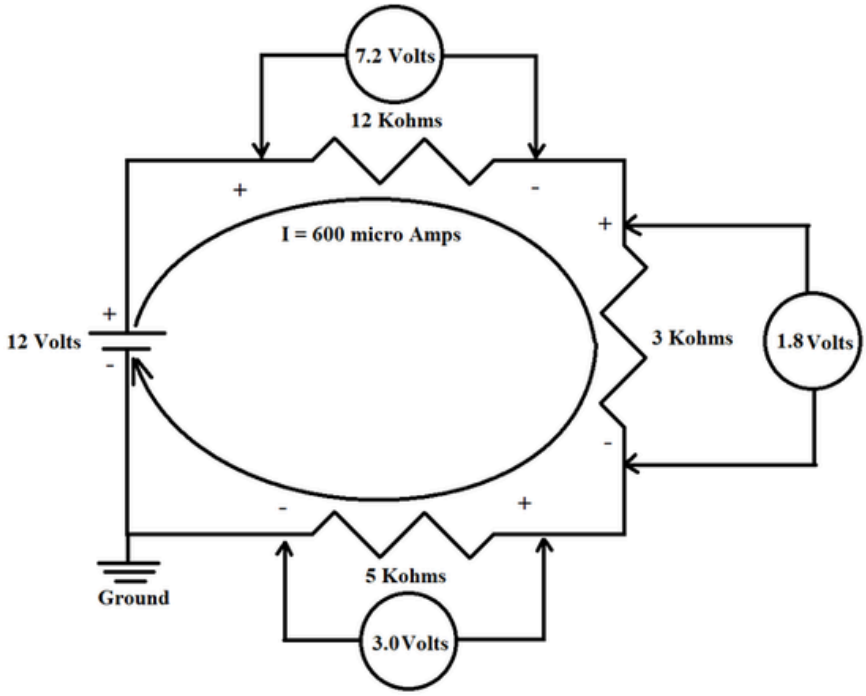
Therefore, (Figure 1) starting from ground and working clockwise around the series circuit, we have.

+12V – 7.2V – 1.8V – 3.0V = 0.

Starting at the positive terminal of the battery and working counter-clockwise, the result is the same:

-12V + 3V + 1.8V + 7.2V = 0.

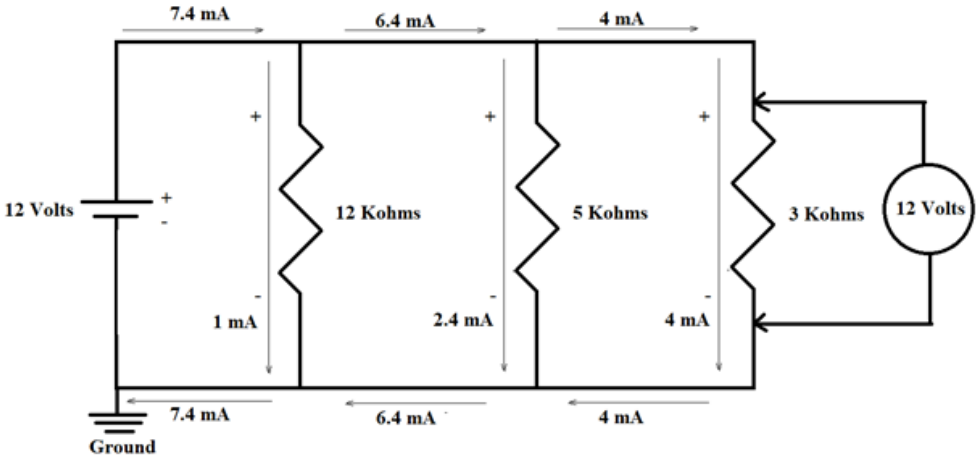
Figure 1:



Kirchhoff's current law

Kirchhoff's current law states that the sum of the currents entering a branch is equal to the sum of the currents leaving the branch(es). Figure 2 illustrates the basic principles of Kirchhoff's voltage and current laws for a parallel circuit (the details of which will be presented next month).

Figure 2: Parallel circuit.



Kirchhoff's voltage law applied for each loop of the parallel circuit is:
Loop 1: VBATTERY – V12Kohms = 0, +12V – 12V = 0,
Loop 2: VBATTERY – V5Kohms = 0, +12V – 12V = 0,
Loop 3: VBATTERY – V3Kohms = 0, +12V – 12V = 0,
Loop 4: V12Kohms – V5Kohms = 0, +12V – 12V = 0, and
Loop 5: V5Kohms – V3Kohms = 0, +12V – 12V = 0.

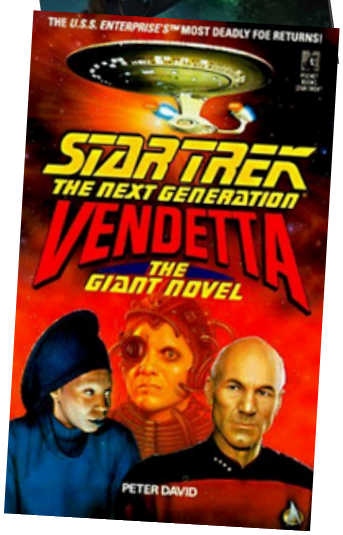
Science Fiction











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 conclusion of the story by Fleet Captain Rahadyan Sastrowardoyo, featuring time travel and alternate history.

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

The Desperate and the Broken-Hearted

By Fleet Captain Rahadyan Sastrowardoyo, USS Challenger

To the memory of my brother Sabartomo Daniel Sastrowardoyo (1965-1986)

Trigger warning/content warning: near-death experience, grief

PROLOGUE: June 13, 1980

Nancy noticed that Tim was very happy when he arrived at home. This was unusual – he was normally quite stoic, even among family -- though not unknown, but she asked him, "What are you smiling about, *Manong*?"

"Oh, nothing, *Inday*. I'm just happy," was her oldest brother's reply. *Inday* meant "pretty" or "beautiful" in the Hiligaynon dialect of the Philippines. It was a common nickname for many of the women on their mother's side of the family. *Manong* was "older brother."

It was six in the evening, and there was only a week left to the school year. Nancy knew each of her brothers' school schedules well. She didn't think Tim had anything going on that day, a Friday, so he was atypically late.

"Uh-huh." Nancy grinned. Though she was only seven years old, she didn't miss much.

"What would you like for dinner?" Tim asked, changing the subject.

"Mama ordered two pizzas for us, since she'll be late coming from work. It should be here soon."

"Oh, good. How was your day?"



Suburban homes on the outskirts of Manila, Philippines, 1980
Photographer: Gustav Neuenschwander, of Bern, Switzerland
ETH-Bibliothek Zürich, Switzerland © John Tewell

She shrugged. "It's first grade. Nothing really exciting." She decided to hold back from telling him about her crush, especially since he wasn't talking about his.

ACT ONE: The End of an Era



In January of 2050, there were programs on several news channels devoted to Caroline Bouvier Kennedy, the recently departed 50th President of the United States.

Her son and daughter, and her younger brothers, each eulogized her at the funeral, as did the current POTUS and a few noted historians. On the screen behind them was a loop of the late president's appearances, from photos of her as an infant with her famous parents in 1957; to her meeting with foreign leaders in her roles as ambassador, vice-president, and president; to dedicating the Transatlantic Maglev Tunnel between Montauk and County Kerry. Ninety-two years compressed into a matter of minutes.

The phrase that was used repeatedly was in reference to Kennedy's having "righted the ship of state" during the previous decade's Mind Control Revolts.

The Acts of Cumberland enumerated the differences between machine learning and advanced data analytics -- what had been misleadingly marketed as artificial intelligence, AI -- and any sentient non-biological entities. As well, new regulations had been enacted to prevent any kind of cybernetic device to be as invasive as the K-Chip – first introduced in the 1990s, just before the Eugenics Wars – and other competitor technologies. The 33rd Amendment affirmed that Constitutional protections only applied to organic, sapient beings. And the medical establishment now focused primarily on other modalities to treat mental and behavioral illnesses, not to mention sensory and cognitive deficits.

However, those strictures were only enforced within the nations that included the United States of America and its allies, not the Eastern Coalition. Over several decades, the temperature of the conflict between the superpowers moved gingerly between cold and warm and back again, but the fragile “peace” could erupt at any minute. The New United Nations and the various regional organizations kept skeptical eyes on it all.

The Academy Award-winning actress Louisa Jacobson had beaten the venerable Scarlett Johannson in the competition to be the actor who would portray Caroline Kennedy in a multi-part series. While this President Kennedy had never written a traditional memoir, she had authorized the Library of Congress to publish a great deal of her personal correspondence dating as far back as her teenage years. She had only been five years old when her father, the senior John Kennedy, was assassinated in Dallas, so her life in the public’s multiple eyes had started early.



Meanwhile, many individuals -- on Earth, its nascent off-world settlements, and in ships sent outward from the Sol system -- weren’t sure what the next chapter of humanity would be like, and whether or not it would be the final one.

ACT TWO: January, 2285



Captain's Log, stardate 8000.3

Sharman *and two other starships have been assigned to convey classified cargo. Per Starfleet directives, each ship has not been apprised of the registries of the other two. Our own course will take us near disputed territory; thus, we are proceeding with caution. Ship's communications will be limited for the duration.*

Evan Eveleigh, the captain of the survey vessel *USS Sharman*, considered recording a personal log, then refrained. It wasn't in his nature to be reflective until things went awry, and he hoped the mission would be uneventful. The ship's destination was known to the bridge and engineering officers on all shifts, but the nature of the cargo itself – ansible crystals for subspace communications – was only known to himself, his executive officer, and the chief engineer. Any other staff would be read in as needed.

Eveleigh had just assumed the center seat for alpha shift. On the screen of an arm of his command chair, he was reviewing scientific and intelligence updates of the sectors through which Sharman would be traveling. Following the current mission, the ship would be converted to a larger science-scout class of similar design – from Gagarin-class to Oberth-class – at Starbase 12, which had more extensive repair and construction facilities than its present destination near the Romulan Neutral Zone.

But Eveleigh would not be commanding the new Sharman. He planned to leave Starfleet after this mission, returning to his home colony of Deneva to live a quieter life. His wife and children had already been there for two

years, and he had not seen them except via comms since before the move out from Earth. After a series of bad relationships, the captain had finally found true love in his 50's and he saw that as auspicious. Life in Starfleet always had a great potential for danger. And while colonial life was not proof from hazards, he felt it could be far safer than the life he had lived for nearly forty years.

He looked over at the second officer, Lieutenant Rand Bouchet, who was at the helm. She would be promoted to be the *Sharman*'s XO, and have a new captain to report to. Within a few years, she would have a command of her own, the captain was certain of that.

The captain considered his longtime friend, J.T. Esteban, whom he had known since Academy days. Esteban had commanded *Grissom* for a few years, and his career had been marked by proceeding cautiously. Jonathan Esteban was a scientist, not a warrior, and that was reflected in his command style.



An urgent tone from the science station prompted Eveleigh to turn the command chair towards it. Science Officer Ovid Olyphant was frowning, and interpreting the signals on one screen and over his ear fob. "Captain, sensors indicate an object in our flight path, two light-hours ahead." He paused. "Apparent size: one meter in diameter. External composition: diburnium, tritanium and other metals." Olyphant turned towards Eveleigh. "Possibly a ship's recorder-marker, but it's not transmitting any signals."

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Helm, maintain speed but approach the object cautiously," instructed Eveleigh.

"Aye, sir. ETA 15 minutes," replied Bouchet.

Olyphant trained the ship's visual sensors on the object as they approached. There was a script along the vertical axis of it that resembled the alphabets of several different non-Federation civilizations, none immediately recognizable to any of the bridge officers. "Possibly the registry of the object or whatever vessel it was launched from," ventured the science officer. "No lifeforms aboard," he added.

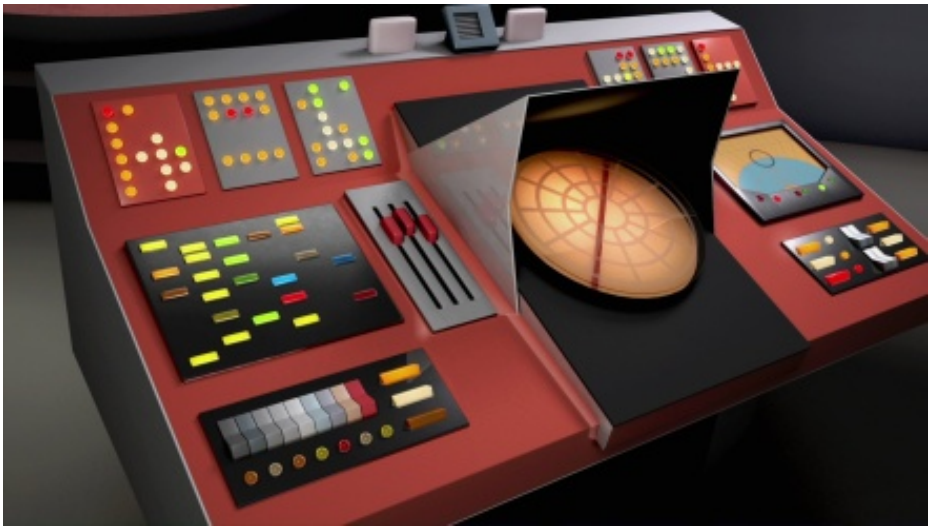
"Beam it aboard the main transporter room," ordered Eveleigh, "but maintain isolation protocols and prepare to decontaminate as needed."

"Aye, sir," responded Olyphant, who relayed the order to the engineer on duty. "Sir, I'll go to the transporter room to check it out and relay my findings."

"Sounds good. Thank you, Commander," said Eveleigh.

"Of course, sir." Olyphant got up from the sciences station and the navigator, Ensign Handzo, took his place. Bouchet could handle both helm and navigation stations unless the ship were to go to yellow alert.

In the transporter room, Lieutenant Henner greeted Olyphant. "No pathogens or harmful radiations detected, sir."

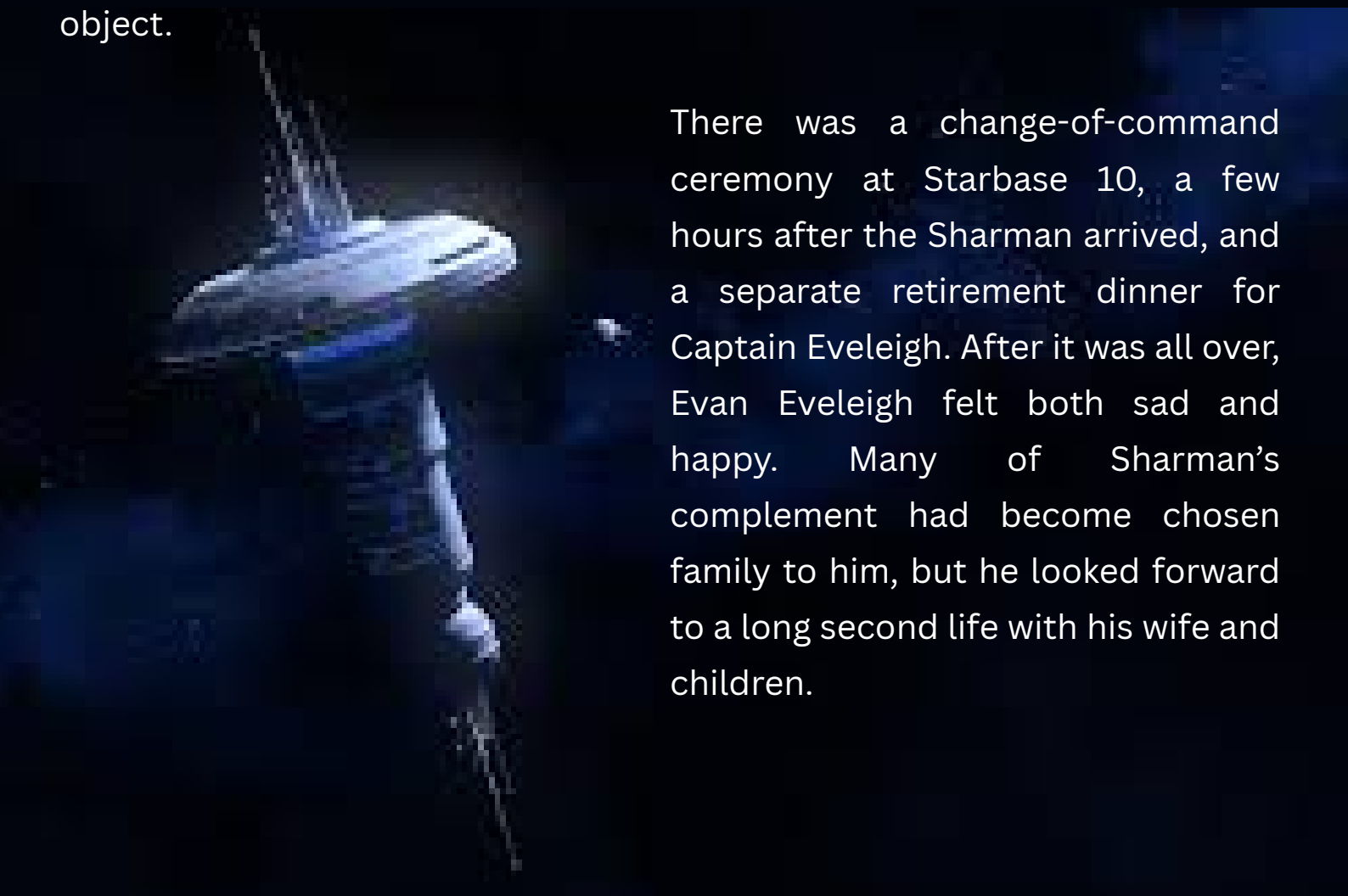


Olyphant nodded at her. “Very good, Lieutenant. Thank you.” From a nearby storage locker, he took out an anti-grav cart and carefully placed the alien object on it. He activated the intercom on the transporter console and told Captain Eveleigh that all seemed to be well. “Unless you believe there’s a pressing need, I think the object should be stored in one of the science labs under standard protocols. I’ll write a brief report to send ahead to Starbase 10.”

“Agreed, Commander,” said Eveleigh. “Bridge out.”

After he had stowed the object, Olyphant dictated a summary of the object’s dimensions as well as several scans of it, and forwarded it to the communications officer on duty to send immediately. Then he returned to the bridge.

At their destination, the officers and crew of the *Sharman* offloaded the secure cargo first, and a science team at the starbase received the alien object.



There was a change-of-command ceremony at Starbase 10, a few hours after the Sharman arrived, and a separate retirement dinner for Captain Eveleigh. After it was all over, Evan Eveleigh felt both sad and happy. Many of Sharman’s complement had become chosen family to him, but he looked forward to a long second life with his wife and children.

ACT THREE: May 30, 1986

Ithaca New York: 4pm. The semester was over, and Danny knew that, in two days, he might never see some of his close friends again.



That included his girlfriend of the past year, Pamela. Danny and his brother Tim had talked on the phone about Danny's relationship a few days ago. Tim seemed to think that it would continue on beyond her graduation. Danny knew better and told Tim as much: "She had a plan before she and I met. She'll stick to it." Danny cared for Pam a great deal, but he was realistic about their future beyond Sunday's commencement ceremony. At 21, he knew he had yet to live the life he really wanted, and he suspected that there would be a lot of changes in his life in the next several years.

Finances, as always, would dictate how his life would progress. He had flunked out of the Engineering school after freshman year, but made up some credits during the summer at Tompkins County Community College a 50-minute bus ride away, then transferred to one of the university's state-subsidized colleges. He would still graduate a semester or a year later than originally scheduled, but that would be okay. That said, a bachelor's in Industrial and Labor Relations wasn't an end in itself, but a stepping stone. The next step would be law school – which law school was an important question. His last undergraduate year would necessitate looking for grants and scholarships.

The only people that might really worry about that were Danny's parents. On the other hand, their own academic paths hadn't been linear. Mama changed majors from pre-law to nursing in order to bring in money to her family faster. Papa had an undiagnosed learning disability as well as depression and anxiety; his degrees didn't come until much later in life.

And when Tim had left NYU after his freshman year, there had been arguments about his decision to transfer to community college and finding a job. It was similar to the arguments about any of them working or dating during high school: *Don't get distracted*. But Tim had countered their parents with the assertion that the pace at which moved was less important than the fact the movement was forward. Mama and Papa had to admit he had a point.

Danny wondered about how different their lives would have been if not for the monetary help given each branch of the family, either by distant relatives or unexpected benefactors. There were a few anecdotes about the latter that he assumed might have been just stories.

During his sophomore year, Financial Aid had sent him a letter about a new grant that he was a recipient of, from the Wold Newton Foundation. As far as Danny could tell, Wold Newton was a town in Yorkshire, England, but also the name of a genetics research firm in Indiana. He hadn't applied for the grant, but was grateful for it. It allowed him to work fewer hours at his job at one of the campus computing centers, and his grades had gotten better.

For the next couple of days, he would enjoy the time with his friends while he could. Then he would go home to Long Island for the summer, probably hang out with his brothers and sister, as well as the high school friends that were still around.

Danny was already dressed in dark blue swim trunks, a red t-shirt well-broken in from freshman year, and well-worn sneakers, but he also took a small gym bag with him to Fall Creek; it contained a light jacket, sunscreen, a phone, and his wallet. It wasn't a long walk from his apartment on Dryden Road. Pam and the rest would meet him there.

Years later, Danny would recall this day often. Pam was beautiful, with dark wavy hair and a kind, warm smile. She was originally from Virginia, and had an accent that inspired in Danny very sly thoughts. Their friends Marc, Laura, Victor, Ziad, and several others, all of whom would graduate on Sunday, were there. A lot of laughing, a lot of showing off, a lot of splashing. Maybe later, they would go to Rulloff's on College Avenue for dinner.



Danny got out of the water to relieve himself behind a nearby tree, then he re-entered the creek a few meters away so he could surprise Pam by swimming under the water then emerging like a shark. Danny had seen Jaws when he was 10, and it was one of his favorite summer movies.

But then it happened. He wouldn't remember what it was – a stomach cramp, a heart attack, a seizure, something else – but suddenly he couldn't see, not even the dark blue of the surrounding water.

As Danny lost consciousness, his thoughts were *Mama, Papa, I'm sorry, I just want to see you and Tim, Ben, and Nancy one last time...*

But he also saw his potential fates. In one timeline, his friends thought he was just playing a prank on them and hiding out in the woods, and Ithaca Public Safety found Danny's body too late. He died. In another, Public Safety personnel were able to revive him, but anoxia had given him severe brain damage, and he was in a vegetative state for the remainder of his days. If he had a choice of fates, it would be the former over the latter.

Unbeknownst to Danny, someone was watching him through binoculars from a few meters away. He had the same coloring and build as Danny, and casually dressed in a polo shirt and khakis. The man quickly dove into the water, and swam with strong strokes towards Danny then swam with him back to the shore and administered CPR with rescue breaths.



The man took out a waterproof pouch from his vest. He aimed a medical scanner at Danny, assessed the readings, and adjusted a hypospray to administer a dose of tri-ox compound. He also had a portable synthesizer to re-create any 20th century medications, just in case. However, a 500-milligram initial dose of amoxicillin to treat drowning-associated pneumonia wasn't indicated. The hospital or clinic here could administer it to Danny if it was necessary, as part of advanced life-support protocols.

There was no external bruising, and scans showed no internal bleeding nor cerebral damage. The man applied the tri-ox to Danny's chest above one of his lungs. Danny coughed out some water and tried to sit up. "No, take it easy," the man said. From Danny's bag, the man took out his phone and hit several keys quickly.

“Ithaca Public Safety,” said a voice on the line.

“Hi, I just pulled a kid out of Fall Creek. I’m not far from the Stewart Avenue Bridge. Male, late teens, maybe early 20’s. Please come quickly.” He replaced Danny’s phone in the bag.

A few minutes later, a uniformed team arrived with a stretcher. The man offered, “I was just walking by and saw … something that looked like a person in the water, but they weren’t moving. I dove in and found this kid. I performed CPR. I hope he’ll be okay.”

The EMTs checked out Danny. They asked him his name, if he knew where he was, the date and if he knew who the President was, to check his mental status. Danny was able to give all of it, then he turned towards the man that had saved him. “Thanks, man,” he said. “I don’t know what happened. I just lost it and… You saved my life. Thank you,” he said again.

The man kneeled down and took Danny’s hand and squeezed it in what he hoped was a reassuring manner. He looked at Danny in what the latter would recall as a sad look, almost teary-eyed. “My name’s Andy. I’m glad to help,” he replied simply.

Two responders carried the stretcher up the trail to their vehicle. Another EMT took possession of Danny’s gym bag and asked the man for his name and number. The man took out a business card, one he had replicated for the incident, and gave it to the EMT. “Andreas de la Cruz. I just started working in town this week and was taking a walk.”

“Okay,” said the EMT. “Someone will call if we need any more information.” He followed his colleagues up the trail.

“Andreas” watched the EMT go, then walked back into town to the hotel where he was staying. The plan was to remain in his cover identity for a couple of days to ensure his distant ancestor’s safe condition. Once that was determined, he’d be able to return to his own century.

INTERLUDE: Unknown Stardate



The Starfleet officer who had called himself “Hartono” in 1929, “Purnomo” in 1994, and “Andreas de la Cruz” in 1986 was crying. “I know I did the right thing, but there were other timelines where I wasn’t there.” It was the Vulcans who had developed tri-ox compound, so any treatment to help Danny would have come from at least 77 years in the future.

Another Starfleet officer, who had called himself “Jantang” in 1994, put his hand on the older man’s shoulder. “These types of missions are a mixed blessing. The ones I really find difficult are the ones in which we have to … let them go.”

Dr’en Kolbert, the director of the Federation Department of Temporal Investigations, watched the two Human men silently. Dr’en’s species did not understand their emotions. The director’s senses noted the changes in neural activity but didn’t grasp the cognitive associations. Dr’en could guess after centuries of practice, but often needed an assistant to interpret. Thus, Dr’en was often thought of as cold by many of the Temporal Investigations staff.

There were still further missions to repair the primary timeline. Fortunately, many operatives reported to the director, some of whom were counterparts of these two from other timelines.



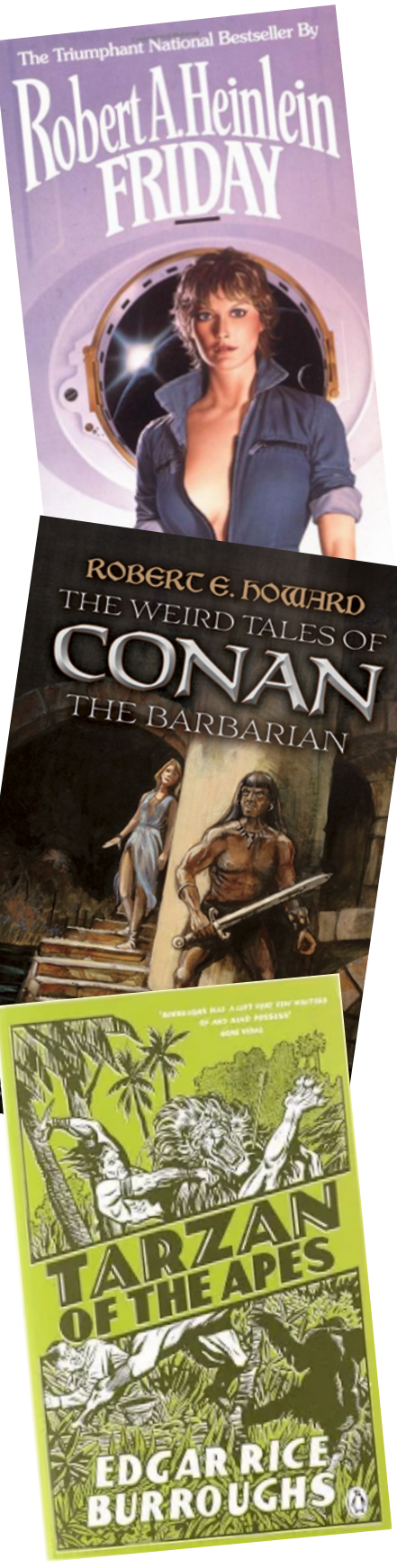
ACT FOUR: July 8, 1983

For Nancy's 10th birthday, her brothers gave her a three-day ticket to BuckCon, the first convention devoted to the series Buck Rogers in the 25th Century. Nancy was over the moon. Her cousins Mellie and Molly had secretly worked on an Earth Defense Directorate dress uniform, like the one Erin Gray wore as Wilma Deering on the show. Carrie, her other close cousin, had sent her a card and spending money for the con, with the proviso "Please tell me all about it!"

Nancy was too young to travel to New York City by herself, so her brother Tim accompanied her. While the convention hotel was not very far from Pennsylvania Station, even Nancy herself was wary of the city. She had only been a few months old when they had moved out to Long Island, and was not as enamored of Manhattan as the rest of her family.

Tim was sometimes nostalgic about Manhattan. He kept in touch with some old friends from the elementary school he'd attended, as had Danny. Ben had only been five years old, and Nancy six months old, when they moved. After Tim's unsuccessful first year at a university in the city, he realized it wasn't for him; the practices that had got him through high school were insufficient beyond that.

He transferred to a community college in town and worked towards an associate's degree. Eventually, Mama and Papa understood that there was a difference between potential and reality, and that their expectations of their children had little to do with who they really were. And, not least, the United States wasn't their respective countries of the Philippines and Indonesia.



Nancy and Tim had taken an early train that got them into Penn Station about half an hour before the convention was to start at 10 a.m. Nancy was excited to wear her costume, but Tim only wore regular clothes, a short-sleeved button-down shirt, jeans and sneakers. Over one shoulder, Tim carried a knapsack that contained street clothes for Nancy should she choose to wear them.

The night before the convention, Tim had asked Danny and Ben if they wanted anything from the dealers' room. "Not the first day, anyway." Danny was a huge fan of Robert A. Heinlein, whose novel Friday had been released the year before, but also of pulp novelists such as Robert E. Howard and Edgar Rice Burroughs. "Just let me know what's there. If you think something will be gone soon, use your best judgement. I suspect some booksellers may provide a discount on Sunday."

And Ben had given Tim some of the money he'd received for his last birthday, his 14th, as well as a list of specific comic books from his want list.

Tim hadn't registered for BuckCon until after the deadline to receive a ticket by mail. Nancy waited patiently with him on the ticket line, then the two took an escalator up to the hotel mezzanine. Nancy wanted to focus on the talks given by the series' actors, and she also had a ticket for a meet-and-greet with Erin Gray, scheduled for 11:30 a.m.

After a walk around the dealers' room, Tim and Nancy walked over to the lines. It wasn't a surprise that the lines for Gil Gerard, Erin Gray, and Thom Christopher were already long, 45 minutes before the meet-and-greets were to begin. Tim and Nancy had eaten a big breakfast at home, and had visited the restrooms before they got on the line. Ms. Gray was scheduled to give a talk in the auditorium at 2 p.m., so her line was going to be capped at 40 people.

During the meet-and-greets, Erin Gray spoke warmly with each of her fans for a few minutes – no more than ten, out of courtesy to all in line – signed a few items of memorabilia such as magazine covers or 8x10s, and then the fan had a choice of using their own camera or a Polaroid SX-70 belong to Ms. Gray's team, to have a photo taken with the actress. In person, she was taller than Nancy had expected. She wore a lavender-colored knee-length dress with a black belt.

Tim let his sister go first. "Hi, I'm Nancy," she said. "I'm very pleased to meet you, Ms. Gray. And thank you for replying to my letters. I realize you must be very busy."

"Hello, Nancy, please call me Erin. And it's a great pleasure to meet you, too!" said the actress. "What a great uniform!"

"Thanks! My cousins made it for me!"

Then the two talked for a few minutes about Nancy's favorite episode, which was the one in which Wilma Deering succeeded Admiral Asimov as commander of the Searcher. A year before, the production team admitted they'd made a mistake in the second season. The third season began to remedy that. Erin Gray's role was restored to a stature similar to what she had in the first season. And she had directed an episode during season three, an experience she greatly enjoyed.

Tim had brought the 35mm camera he'd received several years previously, so he took a few shots of Nancy and Erin. Just to make sure, a month before, he'd had the camera professionally cleaned and serviced. When it was his turn for the meet-and-greet, Nancy took the shot of them. The actress handed each of them a card with her publicist's name and address on it, so that they could send in their photographs to be autographed.

Nancy was very happy. And the weekend had only started.

EPILOGUE 1: Unknown Stardate

Dr'en Kolbert was reading monitors carefully in the Operations Center. His multi-lobed brain could analyze several timelines at once.

As a student at his species' equivalent of a university centuries before, Dr'en had focused on a few select major timelines of Earth history, particularly ones in which different faiths had been more prominent in international affairs than others.

The director had recently studied timelines where a natural disaster had altered history, such as the eruption of Mount Tambora in 1815 that resulted in the "Year Without a Summer", the Tunguska object's impact a

few thousand kilometers east or west of Siberia in 1908, the Indian Ocean tsunami in 2004, the eruption of the Yellowstone supervolcano in 2028, and the Hermosa earthquake of 2047.



The director's remit included having to make decisions related to different ethnic or faith communities' wanting to avenge the depredations visited upon their ancestors. (Others in the Directorate focused on the timelines of different worlds such as Vulcan, Andor, or Qo'noS.)

Each director was given a set of instructions as to what was thought of as the optimal timeline. And those instructions came from several millennia uptime from the "present." It was a matter of debate as to which entities had precipitated the so-called Temporal Cold Wars, and the nature of the conflict was such that no one could predict how it would end.

EPILOGUE 2: June 13, 1980

After dinner, washing dishes, and taking out the garbage, Tim retrieved the binder with his current journal entries from his room. Most of the time, he typed entries directly into the house computer, but he still did initial drafts in longhand on a legal pad. Nancy sometimes preferred to listen to the radio instead of watching TV. She watched her oldest brother as he wrote. His precise handwriting was in imitation of Mama and Papa's, and borne of long practice.

“*Manong*, can you teach me how to keep a journal sometime?” she asked him, on a whim.

“Of course, I can, *Inday*. I’m always happy to teach you whatever you want to know. We can even start now.”

“Yes, please.”

In a hall closet were some school supplies. Tim walked over and took out a plain black composition book. “Is this okay?” he asked his sister.

“Sure. I can always get some stickers this weekend to dress it up.”

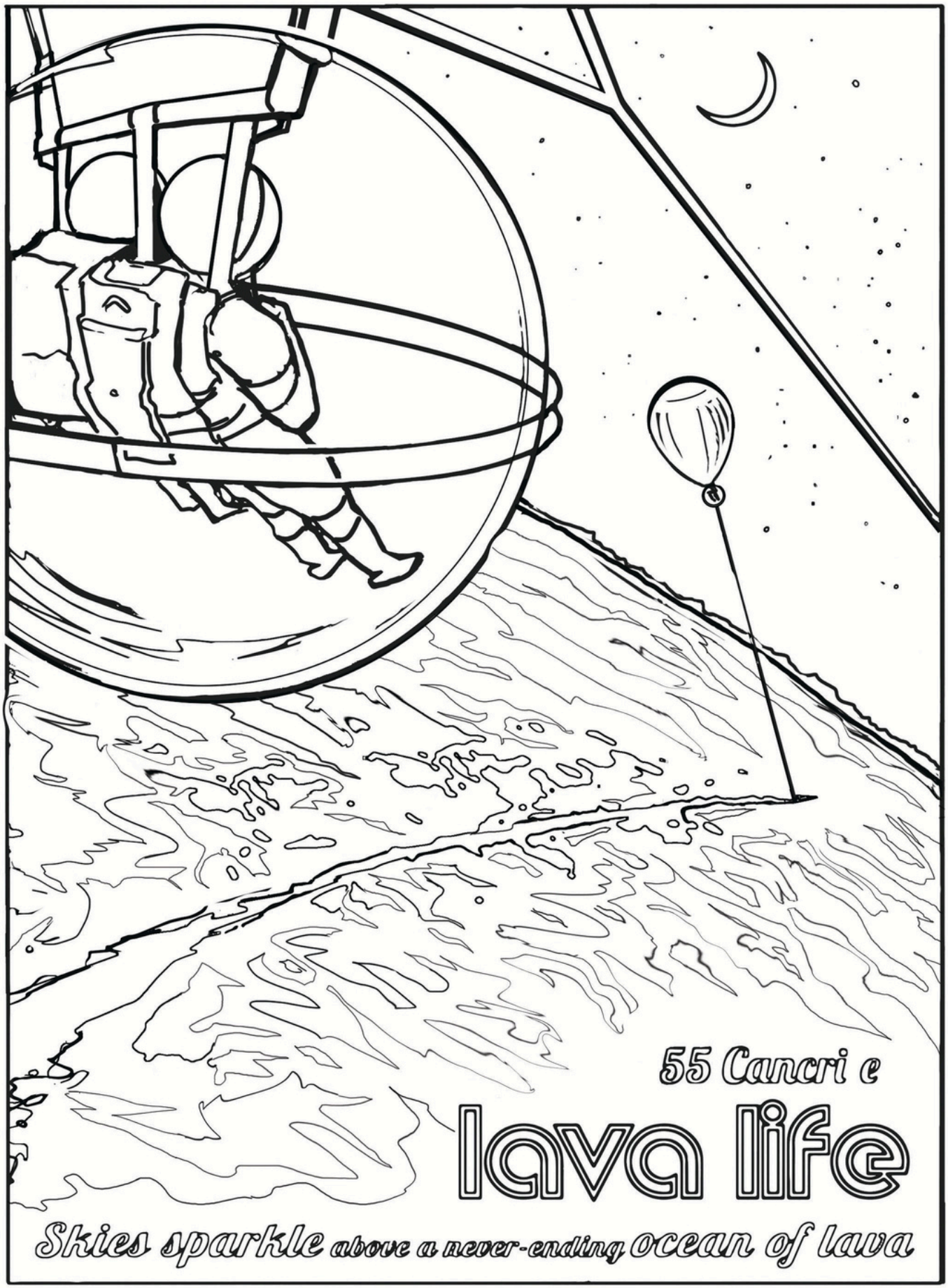
And one of many lifelong lessons began...

...

In the years after Nancy’s death, Tim and her other brothers would often ask themselves, *“Who would Nancy have become, had she lived?”* Her precocity was combined with a steady work effort; her empathy with the capacity to stand up for herself when needed; her idealism with practicality; and her athleticism and competitiveness with kindness and good sportsmanship. Her intended goal was to be a physician -- specialty undetermined at the time she went on the Study Abroad program in Indonesia -- and she wanted to go on at least one mission with Médecins Sans Frontières.

In 1998, Tim named his daughter after her. Each of Nancy’s brothers and her three closest cousins, Melanie, Molly, and Carolyn, visited Nancy’s grave once a year on her birthday for many years.

She was loved very much during her lifetime, and after.



A global ocean of lava and sparkling silicate skies make this dreamy world the perfect extreme vacation! 55 Cancri e, or Janssen, orbits a star 41 light-years away from Earth. The molten surface is uninhabitable, but the views of a burning horizon, Janssen's sister planet, Galileo, and glittering skies will take your breath away.

What colors can you imagine on the ultrahot world of 55 Cancri e?

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

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