Issue 2. October 2024

Event Horizon

The magazine of STARFLEET Sciences



IN THIS ISSUE

Astrophotography special - your pictures plus a getting started guide

The future of STARFLEET Sciences

Horticultural corner

Electrical engineering 101

Inside NEEMO undersea research station

Contents

3. Welcome from the Director's Office
4. From the Editor's Desk
5. Unveiling the Future of STARFLEET Sciences
10. STARFLEET Sciences Awards Programme
11. SFSCI Recommends...
13. Astrophotography gallery
15. Astrophotography Part 1
18. Sol Speaker Series
22. NEEMO (NASA Extreme Environmet Mission Operations)
27. ESA's LUNA Moon habitat
28. Horticultural Corner
29. The Bükki Observatory and the Bükk National Park
32. Heisenberg Compensators
36. The basics of electrical engineering
38. Region 1 sciences
41. The Black Widow and the Regal
43. The Adventures of Stamets
44. Colouring page
45. Xenobiology crossword
46. Staff list and contacts

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

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

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Some images may be created using AI - these will be clearly captioned.

Cover image: The ghost of Casseopeia (IC63). Photo by FCAPT Barton.

"What is a scientist after all? It is a curious man looking through a keyhole, the keyhole of nature, trying to know what's going on."

Jacques Yves Cousteau, French oceanographer

From the Director's Office



Greetings!

I am still in sick bay recovering from a knee replacement so I will keep this message short.

This quarter has been an exciting and amazing one for sciences. We were officially designated as a permanent auxiliary after much hard work by our incredible staff. We've expanded and taken on more personnel to better serve the needs of our members fleetwide all across the planet.

Many of our staff members were given awards at the 2024 international conference and I'm very proud of them for their hard work. Membership continues to grow and we welcome everything they bring to Starfleet sciences.

We are very excited about 2025 and all of the new things that will be happening here in Starfleet sciences. Our Comms channels are always open for your suggestions and ways we can better serve you.

Always seek the truth and keep your curiosity alive!

To the stars,

Fleet Captain Barb Barton

Director of STARFLEET Sciences

From the Editor's Desk

Welcome to the first full issue of the *Event Horizon*!

As I've been putting this together and finding articles I've realised anew what a huge subject science is. Even in *Star Trek*, science isn't just a simple matter of chemistry, physics and biology. Spock could notably turn his hand to almost everything Captain Kirk (or Pike) asked him to do. It's only as I've got older and wiser that I appreciate that that wasn't just a writer's way of getting out of a hole, it was actually an accurate depiction of a top-level scientist!

In this issue of the magazine we also take a look at a wide range of sciences. We have an astrophotography feature showcasing some of the amazing pictures our members have taken, as well as a guide to getting into the hobby. A little closer to home, we look at how the properties of a desert moss may some day aid in terraforming Mars. And back on planet Earth, we are given a crash course in electrical engineering and are introduced to the magnificent Sessile Oak tree.



The back pages of the magazine are designed with younger readers in mind, although it you are of more advanced years and you want to colour in Stamets, go right ahead!

I hope you enjoy reading this issue, and, as always, if you have any comments, feedback, suggestions or content you would like to contribute, please send it to **sfsci-eheditor@sfi.org**

Captain Pam Kingsley

Deputy Director of STARFLEET Sciences & *Event Horizon* editor

Unveiling the Future of STARFLEET Sciences

By ENS Monica Butt, Deputy Director of Education, SFSCI, &
GEN Michael W. Malotte SFMD, R12

Greetings, fellow space enthusiasts and devoted fans of Starfleet Science Auxiliary! Today, we delve into the cutting-edge developments and innovative projects that are propelling us into the next frontier of scientific discovery. First and foremost, let's give a massive cheer for the Science Auxiliary as it officially transforms into a permanent powerhouse status within Starfleet Auxiliaries.

A Quantum Leap in Innovative Projects

Our dedicated team of scientists and educators at Starfleet Science Auxiliary have recently achieved quantum speed status in implementing some exciting opportunities for members to engage in.

The Sol Science Series is thriving! Get ready for the upcoming exciting lectures: Dive into the mysteries of “Black Holes” on October 17th, explore “Protecting the Final Frontier” on November 15th, and uncover the wonders of the Algonquin Radio Observatory in Region 13 on December 5th. *(More information on p18 - Ed.)*

Exciting news from the Starfleet Science Academy! Get ready to dive into the thrilling world of our 6-week Science Academy Challenges! Completing these challenges will not only earn you an award certificate but also pave the way for groundbreaking announcements on the horizon.

Brace yourself for the launch of our very own Certification and Specialization programs in the field of Sciences! By enrolling in these programs, you'll not only become a recognized Specialist in your Starfleet Science career but also earn prestigious titles like Research Assistant, Scientist, Senior Scientist, and more! (Please note that title requirements are currently under review). For full details as they are released **click here.**



In our quest to explore all that the Auxiliary can do for its members, there have been a series of resources for connection and participation. We now have our own Starfleet Sciences Handbook, along with various fantastic Facebook pages and chats. Plus, get ready to explore a vast array of awards waiting for you to earn them - all it takes is a touch of determination and some scientific gumption! Recent awards added include Science officer of the month, Science officer of the year and Region of the year awards. Be sure to check out the awards **here.**

Space-Time Anomalies and Temporal Mechanics

The enigmatic field of temporal mechanics.....and the realm of scientific possibility is where the Auxiliary is spending most of it's time! Be on the look-out for even more ways to participate and get your science game on. Including the creation of SRTs (Science Research Teams), engaging chapter-led missions for scientific exploration, thrilling community projects, hands-on at-home experiments, and loads of fun along the way! Let's dive into the world of science together and make learning an absolute blast!

One thing that's been missing, we feel, are some absolutely incredible science-related workshops for Cadets! 🧬 Speaking of Cadets, get ready to keep your sensors scanning the Academy Cadet College for the exciting new addition of STEM courses! 🚀🔬

Prepare for an exciting lineup of new events! We plan to introduce resources such as science-based pub quizzes and Trek games you can bring along to your chapter meetups, engaging monthly science debates on Facebook, and stimulating science book clubs. Dive deeper into Astronomy-based science and seize the chance to showcase and publish your very own scientific research or science article reviews in the prestigious *Event Horizon* and keep an eye out for our thrilling Spotlight on Scientists column - your moment to shine is just around the corner!

Away teams, prepare to beam down!



We are pleased to introduce the Scientific Research Team program! The Scientific Research Team (SRT) is the smallest unit in the STARFLEET Sciences Auxiliary. They are chapter-based, and size can vary, consisting of a single member or dozens. To be an official member of the chapter's SRT requires three things: STARFLEET membership; affiliation with the STARFLEET Sciences Auxiliary in the database; and **signing up for membership with the STARFLEET Sciences Auxiliary**.

SRTs can – and are encouraged to – have nicknames, mottos, and logos. The primary purpose of the SRT is to serve as an informational and communications resource for the chapter in all things science. Through this, we can enhance interest in science within the chapter's membership and promote science education wherever possible.

Its mission is to foster participation in science-related activities. Activities, such as away missions to science-related venues in the area, can be both a chapter and multi-chapter activity. There are many areas that offer science-related venues for tour and explorations. In the United States, examples include the Kansas Cosmosphere in Hutchison, Kansas; the Space Centers located in Houston, Texas and Cape Canaveral, Florida; and the US Space and Rocket Center in Huntsville, Alabama. In Canada, you can visit the Canada Aviation and Space Museum, the Calgary Science Centre, the Edmonton Space and Science Centre, and Science World B.C. in Vancouver. South America has The Spaceport in French Guyana and, while in Australia, you can visit the Australian Space Discovery Centre in Adelaide. Europe also offers many destinations of interest including the European Space Agency HQ in Paris, France; the National Space Centre two miles north of Leicester City Centre in the UK; the Technik Museum in Speyer, Germany; and the Space Expo in Noordwijk, Netherlands. And there are planetariums in many areas across the globe.

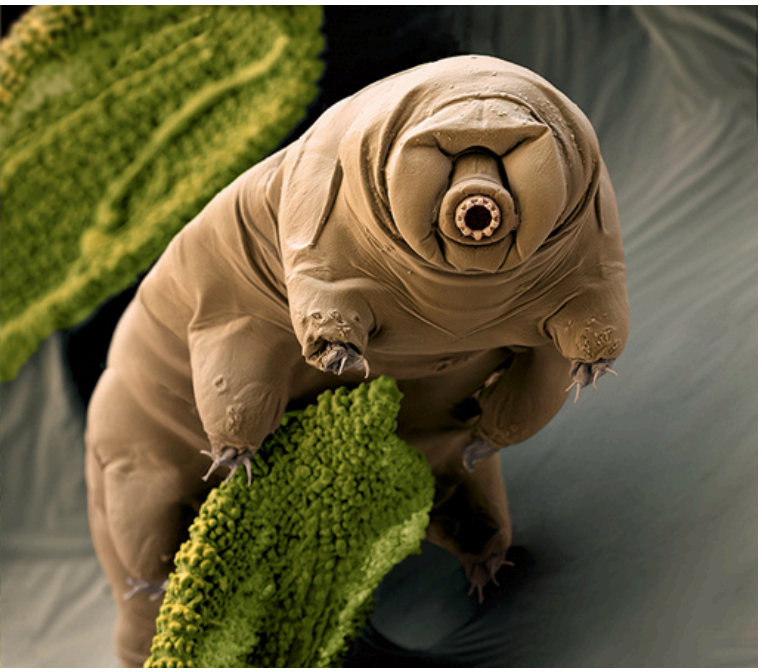


Activities can also include chapter projects and programs. There are many projects a chapter can take on that are science-related - recycling,

conservation, and highway clean-ups are but a few that can be done on a local basis. SRT projects could also be as simple as school science projects (these can help get the junior members involved) or as detailed as setting up a chapter recycling program. The Scientific Research Teams are a great way to get the members involved in the ever-evolving world of scientific discoveries. We look forward to hearing about the adventures your SRT will have!

Exciting times ahead!

This is your chance to contribute to shaping the Science Auxiliary of your dreams. We want to hear all about what you want to see more of. Feel free to reach out with any questions you may have – and don't forget to give a big hello to our awesome mascot Stamets when you stop by!



As we look towards the future, the Starfleet Science Auxiliary remains committed to pushing the boundaries of scientific knowledge, exploring the unknown, and inspiring the next generation of explorers. Join us on this thrilling journey of discovery and innovation as we continue to boldly go where no one has gone before.

Remember, the universe is vast, but with curiosity as our guide and knowledge as our fuel, there are no limits to what we can achieve together.

STARFLEET Sciences Awards Programme

At STARFLEET Sciences we want to reward those who make an extra effort or acheve something special. To that end, we have created these awards to recognise members' achievements.

Gladstone Award – Awarded to Cadets who graduate from the Vulcan School of Sciences

Keiko O'Brien Award – Awarded to any SFISCI member who completes one entire school within the Institute of Sciences as well as one entire school within the Institute of Alien Studies, simulating a demonstration of the principles taught by the namesake educator of inclusion of all species within the Star Trek universe where education is concerned.

Vidiian Exploratory Award – Awarded to members of SFISCI for exploring a diverse number of courses out of the Institute of Medical Arts, Institute of Science, Institute of Space Studies, Institute of Technology, and the College of Temporal Physics within the Institute of Star Trek Studies. Members are expected to complete a total of 25 courses, with no more than 5 courses coming from any one college.

Emory Erickson Award – Awarded upon the completion of four Academy Challenges in a calendar year.

Uhura Award – Awarded to members who have excelled in communications through submitting articles to the *Event Horizon n*ewsletter, posting on SFSCI social media, and/or doing outreach on behalf of Sciences.

To apply for an award fill out this nomination form

SFSCI recommends...

Each issue the command staff of STARFLEET Sciences will share some of their favourite science-themed websites, books, equipment, places, podcasts, etc. from the past quarter.

Bridge Command in Vauxhall, London, UK. It's like stepping into the bridge of a real Starship on a mission with your crew! Everyone has a Bridge station, you're working together to accomplish a mission, each ship has different elements from a shuttlecraft, to a medical bay to a ready room, and yes, the engineers have to physically run around the ship to keep the warp core intact! Every bit is realistic, even down to Ten Forward! If you've not taken the leap and gone on a mission yet, take this as your sign.





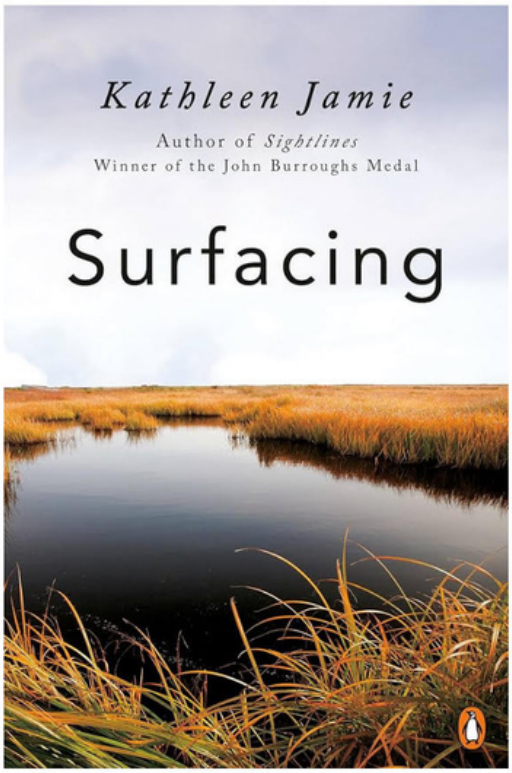
ENS Monica Butt, Deputy Director of Education



Zooniverse citizen science projects. What started as a planet-hunting project has now expanded to include bird watching, Martian cloud spotting, analysis of placentae, and the evolution of cricket wings, among many others! My current favourite is *Where is Spoony?*, which is identifying and tracking individual spoonbills as they migrate.

CAPT Pam Kingsley, SFSCI Deputy Director

Surfacing By Kathleen Jamie
2019 Penguin Books



This non-fiction book contains a series of essays that explore the effects of warming temperatures in different communities around the globe in terms of time, culture, and a sense of place.

From the thawing tundra linking a Yup'ik village in Alaska to its hunter-gatherer past, to the shifting sand dunes revealing the impressively preserved homes of neolithic farmers in Scotland, poet and author Kathleen Jamie looks deeply into cultures and the passage of time.

Once remembered only in stories, long-lost cultural artifacts are exposed as their frozen peatland tombs melt due to global warming - reuniting a people with their past. An interesting perspective on another set of impacts related to climate change.

FCAPT Barb Barton,
SFSCI Director



Gallery – your pictures



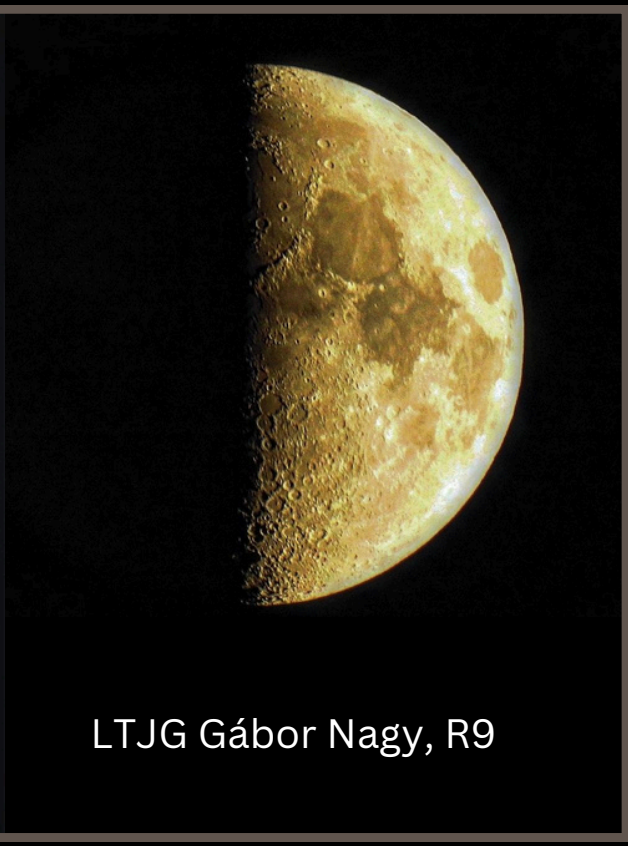
LTJG Amanda Phillips, R11

In each issue we would like to showcase your photography. If you have any pictures you would like to share, please send them to sfsci-eheditor@sfi.org

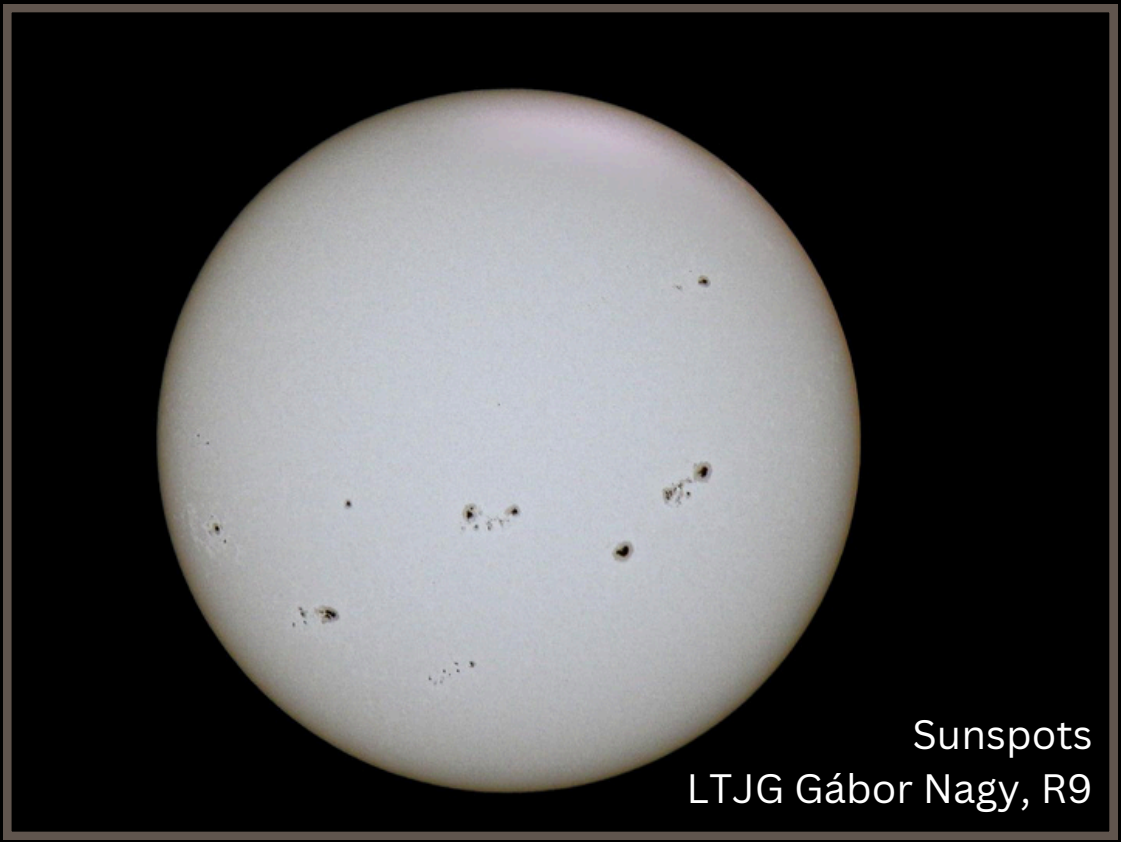


LCDR Kirk Steinbruegge, R12

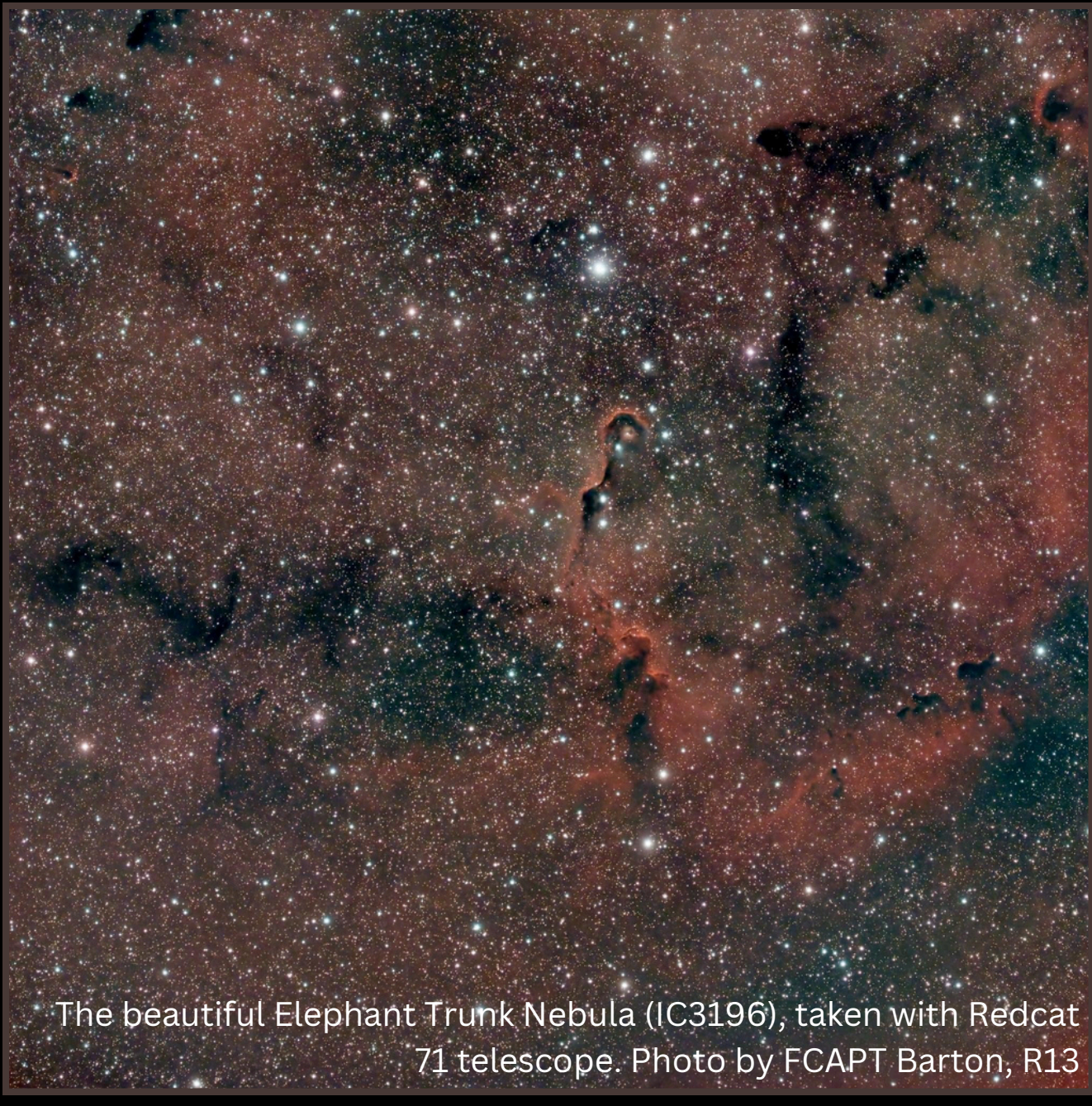




LTJG Gábor Nagy, R9



Sunspots
LTJG Gábor Nagy, R9



The beautiful Elephant Trunk Nebula (IC3196), taken with Redcat 71 telescope. Photo by FCAPT Barton, R13

Astrophotography Part 1 – Discovering the Rabbit Hole

by Fleet Captain Barb Barton, R13

This is the first in a series of articles about the rewarding hobby of astrophotography.



FCAPT Barton and her friend Hatice taking their first photos of the moon using an iPhone through a spotting scope.

It was the fall of 2022. I had been out doing bird surveys that day using a spotting scope and binoculars. As the sun set and the moon began to rise, a question popped into my mind. I wondered what the moon would look like through the spotting scope. I set up the scope on a sturdy tripod and pointed it toward the moon. The view was spectacular – I could see the craters in great detail and the dark gray mares (seas). As I am a photographer, I naturally pulled out my cell phone to see if I could get a picture through the lens of the spotting scope. By this time a friend had joined me, who was much better at aligning the phone than I was. We then moved the scope to Saturn where we could see its rings, then on to Jupiter for a gaze its brilliant moons. Now I was on a mission.



Top left: FCAPT Barb Barton freezing in February taking photos of the Orion Nebula (M42) from her backyard in Lansing, Michigan. Bottom right: FCAPT Barton's Redcat 71 astrophotography set up which she currently uses.

I began researching the internet for instructions on how to photograph the moon, and quickly learned that I could use my DSLR camera and a lens to take pictures of the moon and most exciting of all, the Orion Nebula. To get nice round stars, especially if you shoot longer exposure times, you need a star tracker, a device that tracks the stars as they move across the sky due to the Earth's rotation. Untracked stars will show up as elongated ovals of light, especially as you increase the exposure time of the image.

Night after night through the freezing cold winter, I took photographs of the Orion nebula and the Pleiades. I thought my images of the nebula were fabulous (I learned later not so much). But I could never get the stars in focus. There are methods for this, like using a Bahtinov mask. It didn't help, I just could not master the task. Discouraged, I was ready to quit. I wanted to throw the whole kit and kaboodle into the river. But then, a miracle happened.



In the springtime of 2023, I received a financial settlement due to a previous auto accident. It allowed me to finally retire and consider upgrading my equipment (the beginning of the rabbit hole). I had been working with a mentor on learning how to photograph the night sky, so I asked him to put together a list of equipment that would allow me to take beautiful images of deep sky objects such as nebulas and galaxies.

By mid-summer, my new astrophotography set up had finally arrived. I began using my new telescope (Redcat 71), a dedicated astro camera (ZWO 533), and good quality mount (iOptron GEM45). And best of all – I got an automatic focuser!

It took many months before I was finally comfortable with setting everything up. There are lots of cables and the telescope must be balanced and polar aligned. There were many nights that I could not produce a nice image...elongated stars appeared, or various streaks across the frame from something slipping, or there was not enough power for the camera to run. I felt those familiar feelings of frustration and started thinking about the river...but I kept at it.

Then one night, nothing went wrong. Then another, then another. Soon it was two weeks of imaging with no issues. I had finally become proficient at setting up my rig. And when that day finally came where something was amiss, I knew exactly how to diagnose it and fix it. And the images, they blew my mind.

But capturing the images is less than half the battle. What you do with them after is where the astonishing nebulosity and color seems to magically appear. We will talk about that in the next issue of the *Event Horizon*.

SOL SPEAKER SERIES



Next event: October 17th, 7pm EST/11pm GMT
Arjun Ayyangar, NASA Solar System Ambassador
“Black Holes”

We will discuss the formation of black holes, their variable size range, and the evidence of their existence. We will also describe how understanding black holes will give more insights on understanding the universe.

Arjun Ayyangar is a volunteer NASA Solar System Ambassador since 2018, and has received his Masters Degree in Computational Sciences and Robotics from South Dakota School of Mines & Technology, and another Masters Degree in Computer Science (Machine Learning Specialization) from Georgia Institute of Technology. He is currently working as a Systems Engineer at Lockheed Martin, Mount Laurel, New Jersey.

His other interests include music, and he is a multi-instrumentalist who plays the piano, harp, organ, Indian Instrument Veena and Persian Instrument Santur. He is a Goodwill Ambassador for Empower the Children. His YouTube channel is **https://www.youtube.com/Ayyangar**



November 22nd, 7pm GMT/3pm EST
“Protecting the Final Frontier: The Role of UK Space Command”
Major Sam McEvoy

Space is a congested and competitive domain. Hazards in space range from space weather to space debris. The space domain also includes a growing range of threats, including nefarious activity from hostile and irresponsible actors seeking to maximise their advantage in the space domain.

Based in Buckinghamshire and staffed by Royal Navy, British Army and Royal Air Force, alongside civil servants and contractors, UK Space Command's mission is to work with allies and partners around the world to make space safe, secure, and sustainable for all generations.

Major Sam McEvoy is a serving UK Army officer and lifelong Trekkie who is currently working at UK Space Command. A devout technophile, his career has included such areas as Space, Artificial Intelligence, and Quantum Computing for UK Defence.

December 5th, 7pm EST/ 11pm GMT
“The Algonquin Radio Observatory”
FCAPT Randy Mitson



The Algonquin Radio Observatory (ARO), located in Algonquin Provincial Park, Ontario, was established in 1959 by the National Research Council of Canada (NRC) as a radio-quiet site for advanced research. The observatory is home to Canada’s largest radio dish, the 46-metre antenna, which has been

instrumental in significant astronomical discoveries, including the detection of quasars and pulsars. The ARO has contributed to manned lunar missions by receiving telemetry and tracking data, and today, it remains an essential part of the global positioning system (GPS) network. Since 2007, Thoth Technology Inc. has operated the site, continuing its work in very long baseline interferometry (VLBI), satellite downlinks, and deep spa.

FCAPT Randy Mitson serves as the Director of STARFLEET Petfleet, Chief of Staff for Region 13, and Executive Officer (XO) of the USS Renaissance based in Montreal, Quebec. An adventure enthusiast, Randy spent four years as a wilderness guide in Ontario's Algonquin Park, where he shared the beauty of the night sky with clients. His explorations led to the discovery of the Algonquin Radio Observatory, and later, he helped lead tours during its restoration. He has guided groups to photograph the observatory's iconic 46-metre dish under starry skies and northern lights.



January 2025, details TBC

“The Universe Through Geordie's VISOR”

Dr Alfredo Carpinetti

Italian astrophysicist, science journalist, and science communicator Dr Alfredo Carpinetti has a Ph.D. in Astrophysics and an M.Sc. in Quantum Fields and Fundamental Forces from Imperial College, London, and a bachelor degree in Physics and Astrophysics from Rome’s first university La Sapienza.

The Sol Speaker Series 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.

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

If you have any suggestions for topics or speakers for future talks, email **sfsci-director@sfi.org** If you have specialise in an area you think would make a good subject for a talk, please let us know - we would love to include speakers from within STARFLEET.

If you would like to get more involved in the Sol Speaker Series, we are looking for Regional Sol Liaisons to assist with bringing speakers in from around the world and making our events more accessible to everyone regardless of the time zone differences. For more information email the director.

If you miss a live event, recordings are posted on SFI's YouTube Channel **here**.



NEEMO

(NASA Extreme Environment Mission Operations)

by CDR Patrick Litton, R1

In 2001 NASA (National Aeronautics and Space Administration) founded a very unique mission. The mission, NEEMO (NASA Extreme Environment Mission Operations) was created to train astronauts, engineers, scientists as well as other personnel to live in Aquarius, the world's only undersea research station. Training in Aquarius can last for seven days up to three weeks, depending on the mission. Some current missions can last longer than three weeks.

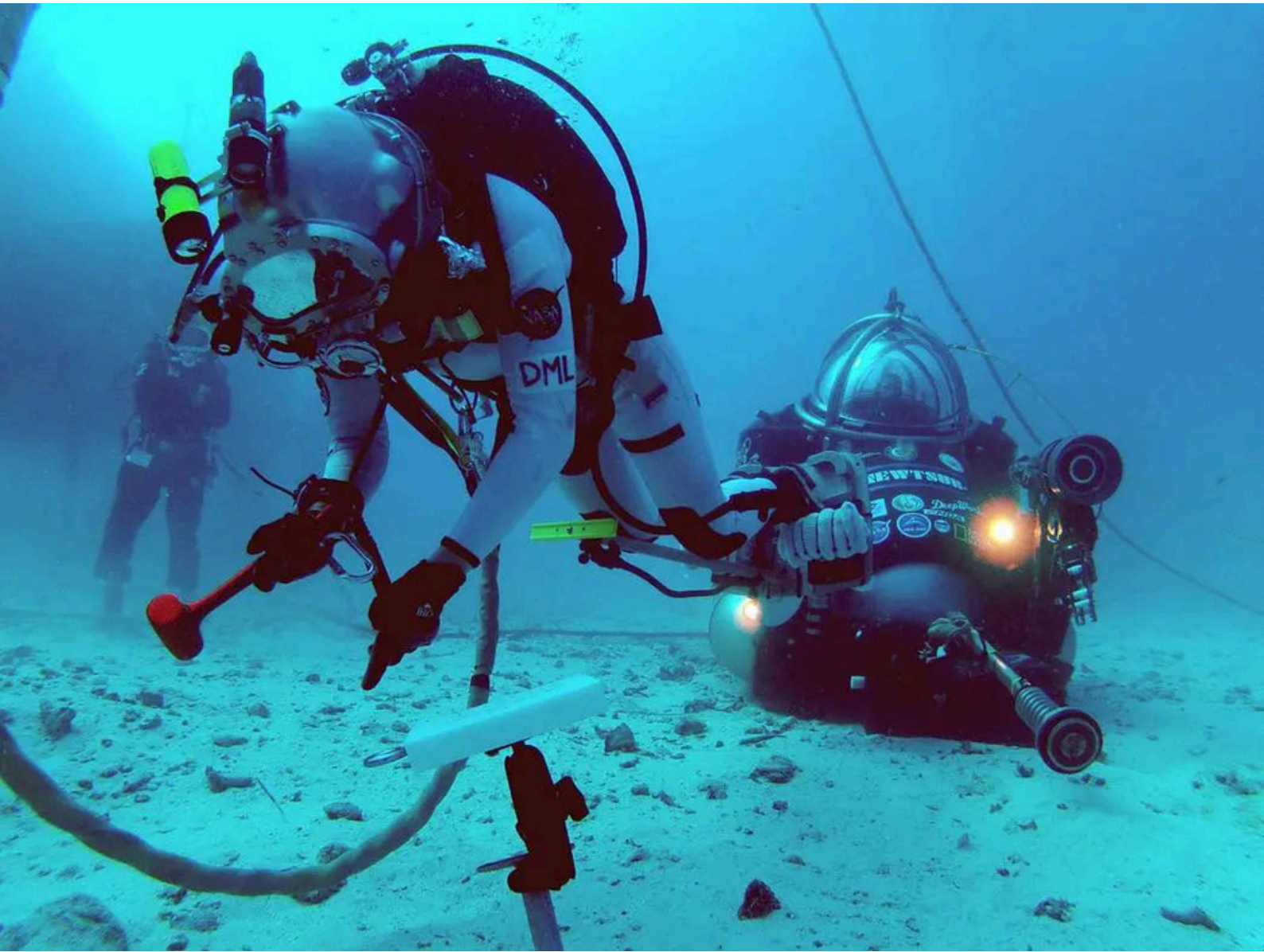
Aquarius is located 62 feet (19m) below its location off Key Largo in the Florida Keys National Marine Sanctuary. It is deployed next to deep coral reefs below the surface. Aquarius is operated by the Florida International University (FIU).

Aquarius' habitat and its surroundings are designed for analog missions for space exploration. Like space, underwater training can simulate the hostile and hazardous conditions of space. Analog missions are field tests in certain locations that have similarities to extreme environments. Tests include: new technologies, robotic equipment, vehicles, habitats, communications, power generation, mobility, infrastructure, and storage.

During the crew members' time in Aquarius, behavioral effects-such as isolation and confinement, team dynamics, mental fatigue, and effects are observed. NASA engineers and scientists work with government agencies, academia, and industry to acquire the requirements for testing in harsh environments before they are in space. Space research is mainly conducted by international astronauts. Analog test locations include the Antarctic, oceans, deserts, arctic and volcanic environments.

Analog missions test for hazards in space. These hazards include: space radiation which has possible cancer risk as well as later cognitive function, reduced motor function, and behavioral changes. Space radiation may also affect the central nervous system. Testing for issues of confinement and isolation. Any group of individuals who are confined in a small space for a long period of time, no matter how well trained, can have issues in dealing with each other.

Possible hazards of confinement and isolation are: a decline in mood, cognition, morale, or interpersonal interaction, sleep disorder, depression, fatigue and boredom. The more confined and isolated humans are, the more likely they are to develop behavioral or cognitive conditions. A third hazard test is the distance from Earth. With Mars being so far away at 140 million miles (193 million km) from Earth on average, communication









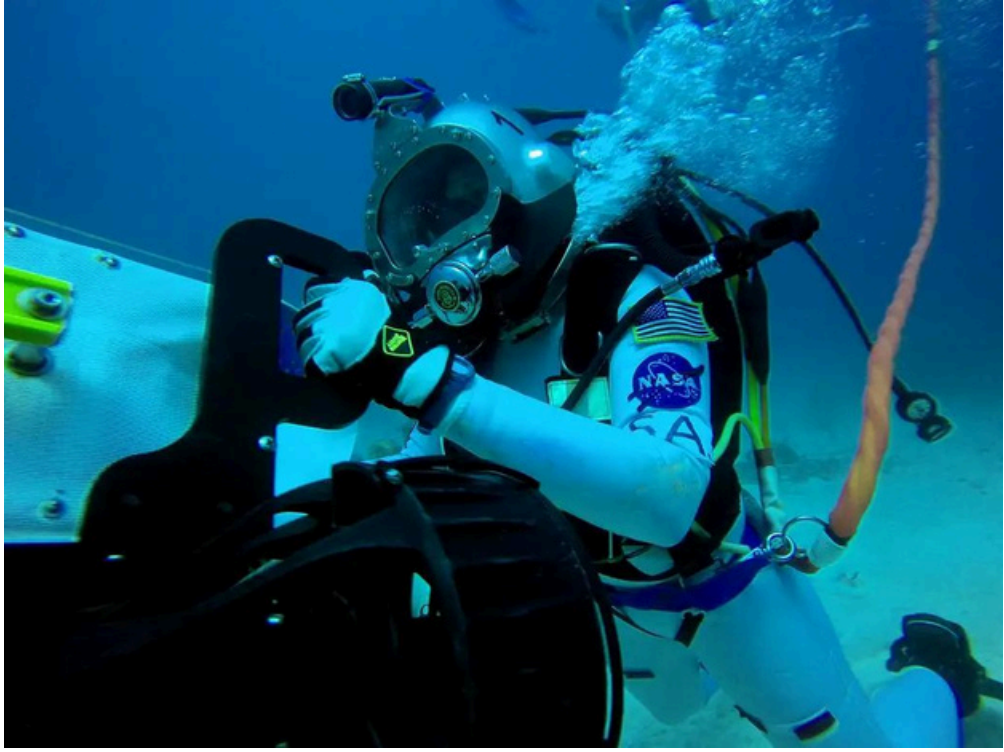


delays of 20 minutes, and possible equipment failures, astronauts have to be able to complete missions on their own. There must be the correct food, medicine, and other supplies to sustain them for the duration of the mission.

On a Mars mission, another possible hazard would be gravity fields. Astronauts would experience three gravity fields: weightlessness between planets, a third of Earth's gravity on Mars, and normal gravity upon returning to Earth. Some but not all possible hazards would be: balance and locomotion are affected, fluids shifting pressure could be placed in the eyes causing vision problems. A loss of bone density and muscle loss, among other conditions, can occur.

One last area of possible hazards is the environment of the spacecraft. Microbes can change characteristics in space. Microorganisms are transferred more easily from person to person in closed habitats like the space station. Living quarters must be carefully designed to ensure comfortable temperature, lighting, noise-level, and aquate space. The main possible hazard is elevated stress hormones altering the immune system and leading to allergies, illnesses, and disease.

Crewmembers on the Aquarius are called aquanauts. A technique known as saturation diving allows the aquanauts to live and work underwater for days or weeks at a time.



Saturation diving allows divers to accurately predict how much time they will need to decompress before returning to the surface. This information limits the risk of decompression sickness. Living in the Aquarius habitat and living at the same depth on the ocean floor, NEEMO crews are able to remain underwater for the duration of their mission.



Aquanauts perform EVAs (Extravehicular Activity) outside of the Aquarius habitat to test spacewalk techniques that they would use outside a spacecraft. The Aquarius and its surrounding environment provide a convincing analog for space exploration. NEEMO crew members experience some of the same challenges that they would face on a distant asteroid., planet (i.e. Mars) or Moon. An additional benefit of the underwater condition is the aquanauts can 'weight' the aquanauts to simulate different gravity environments.



In June of 2023, the NEEMO-23 mission crew members focused on both spacewalks and objectives related to space missions for the International Space Station, and future deep space missions to the Moon and Mars. Future planetary science concepts and strategies, as well as marine science, will be performed under the guidance of the Florida International University's marine science department.

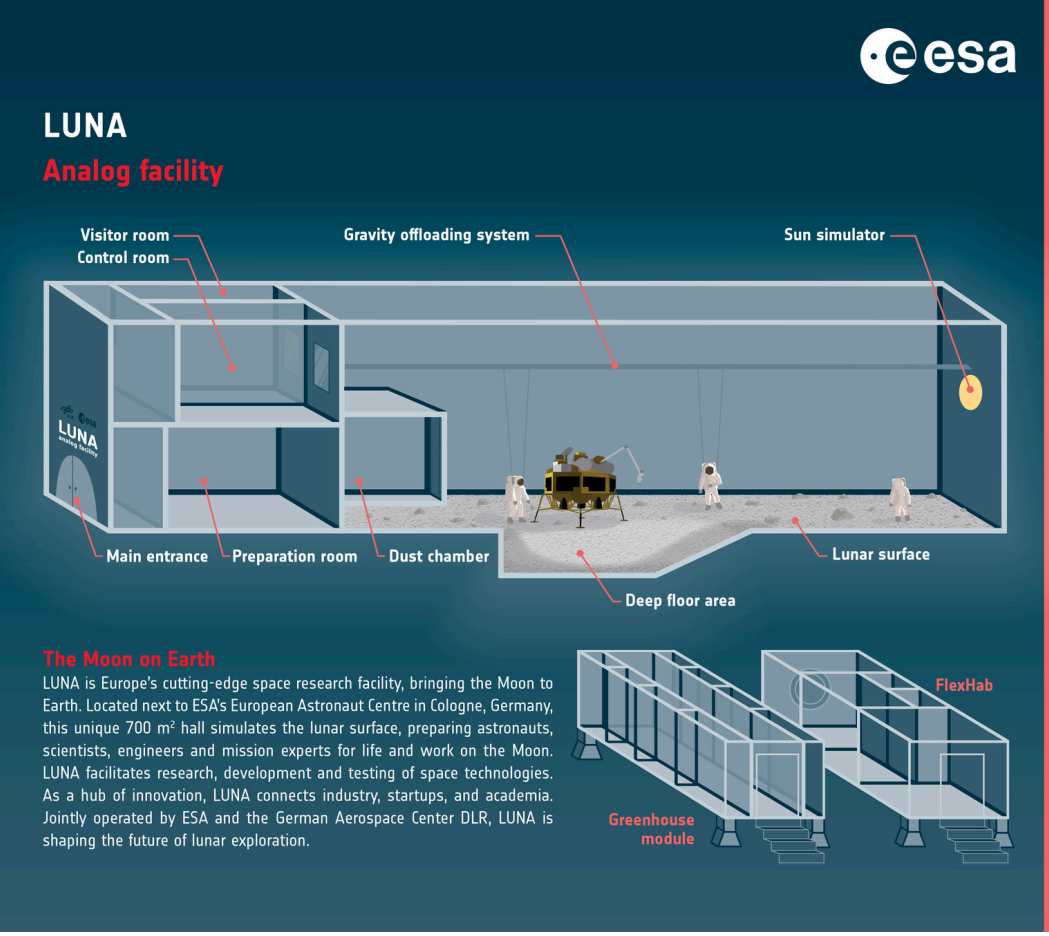
NEEMO missions continue to evolve and improve. Information, concepts and testing provide critical information for the future missions outside the NEEMO missions such as the future Artemis missions intended to return to the Moon. The Artemis missions will land the first woman and person of color on the Moon. Thanks to the NEEMO missions, many aspects of space exploration are developed.

Sources:

NEEMO - NASA

NEEMO by Wikipedia

All pictures from NASA



In Europe, ESA has created LUNA, a recreation of the Moon's surface on Earth next to ESA's Astronaut Centre (EAC) in Cologne, Germany. LUNA combines a 1000 m2 area of simulated lunar soil with a Moon habitat, powered by an innovative energy system, representative of what could be used for a lunar base.

This collaborative project between ESA and the German Aerospace Centre (DLR) will provide a training ground for astronauts and a test centre for technology, equipping partners and users with the knowledge to go forward to the Moon.

LUNA's main hall contains a 700 m2 regolith testbed, made from a lunar dust simulant. Further preparatory rooms, lab space, and supporting infrastructure will bring the full facility area to about 1000 m2. An adjacent habitation module, known as Future Lunar Exploration Habitat (FLEXHab), will represent what could be a lunar base module where astronauts will live and work. Both FLEXHab and the main hall will be powered by solar energy systems that will be combined with innovative fuel cell technologies for the operation of FLEXHab.

Horticultural Corner

FCAPT Phyllis Seale Foynes (R20) looks at the national tree of Ireland



Quercus petraea is a large sized, long living tree that is important ecologically as habitat for hundreds of invertebrate species along with many species of birds and mammals.

Sessile means that the acorns have no stalk, which is a handy method of identification. It also has low set leaves that sit close to the branch. With a trunk that can be up to 2m in diameter it has grey/green bark with vertical grooves that channel rain water down to its roots. It prefers acidic and poor soil with full sun.

Propagation is done by planting the acorns in autumn.

***Quercus petraea* (the Sessile Oak)**
Genus: Quercus
Kingdom: Plantae
Order: Fagales
Height: Up to 40m
Spread: 20-30m
Average lifespan: 500 to 1,000 years



Harmony of Stars and Nature: The Bükki Observatory and the Bükk National Park

Words and pictures by Gábor Nagy, USS Versailles, R9

The Bükk National Park, located near Répáshuta, one of Hungary's largest and most diverse natural areas, offers unique experiences not only with its rich flora and fauna but also for those interested in astronomy. Located in the heart of the park, the Bükki Observatory, which opened its doors in 2022, provides visitors with a unique opportunity to get closer to the wonders of the universe.

The Bükk National Park

The Bükk National Park was established in 1977 and has since been a center for conservation activities. The park covers an area of over 43,000 hectares and is home to numerous rare and protected plant and animal species. In addition to the stunning karst formations, caves, and forests of the Bükk Mountains, the park also boasts a rich cultural heritage, including medieval castles and traditional villages.



The Bükki Csillagda

The Bükki Csillagda is a modern astronomical and natural science visitor center that offers interactive and educational programs for those interested in astronomy and nature. The central theme of the observatory is the Sun, whose effects and characteristics visitors can learn about through various exhibitions and demonstrations. The main instrument of the observatory is a 61 cm diameter Corrected Dall-Kirkham type astrograph, which enables high-quality astrophotography and visual observations.



Exhibition Hall

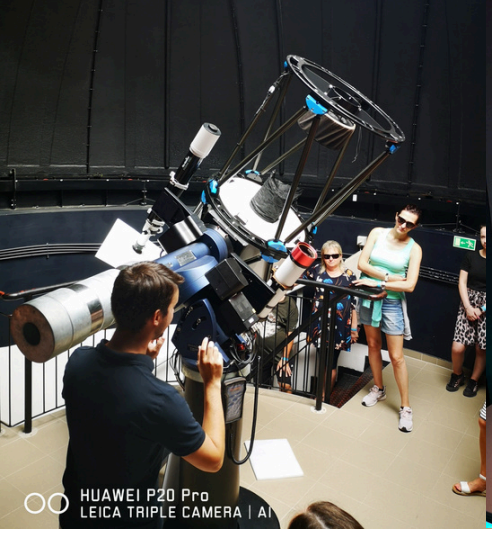
The central theme of the exhibition hall is the Sun and its impact on Earth. Here, visitors can learn about different types of stars, the life cycle of stars, and the invisible characteristics of the Sun. The exhibition is made even more exciting with interactive elements such as holographic displays and augmented reality (AR) technology.

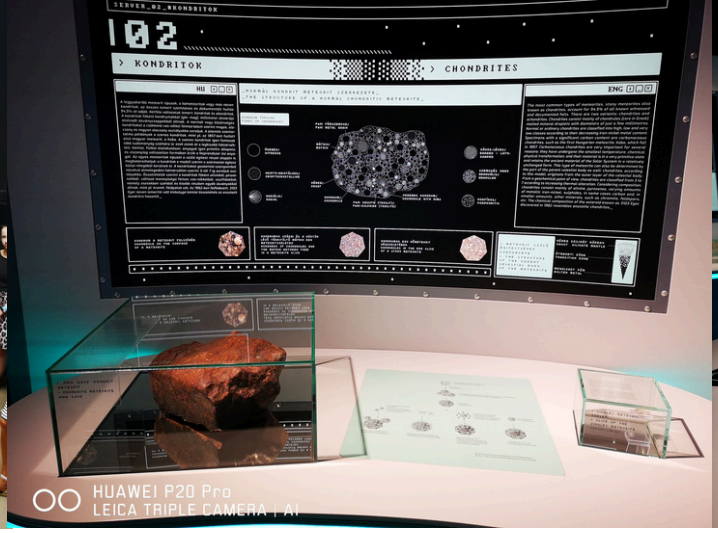
Planetarium

The planetarium has 50 seats and features an 8-meter diameter dome made of perforated aluminum. The wonders of the night sky are projected in 4K quality by four laser projectors, providing a stunning visual experience. Visitors can enjoy various shows that present different aspects of the universe.

Observatory and Telescopes

The observatory is housed under the world's largest mass-produced astronomical dome. The main instrument is a 61 cm diameter Corrected Dall-Kirkham astrograph, which produces high-quality images for astrophotography. This telescope is also suitable for visual observations, thanks to its high-quality two-inch eyepieces.







During the night programs, visitors can participate in telescope demonstrations to observe the beauty of the starry sky. Additionally, the Bükk Star Observatory boasts a special meteorite collection, where visitors can touch and examine rocks from space using a special microscope.

The Planetary Trail

The Planetary Trail near the Bükki Observatory is a unique route that showcases the planets of the Solar System with informational boards placed according to their scale and distances. This trail offers an exciting experience not only for astronomy enthusiasts but also for nature lovers, as it winds through the beautiful landscapes of the Bükk Mountains.

The Bükki Csillagda and the Bükk National Park together offer a unique opportunity for nature and astronomy enthusiasts to find the most interesting programs for them. Whether it’s daytime hikes or nighttime astronomical demonstrations, the Bükk always has something new and exciting to offer.



Heisenberg Compensators

An in-universe explanation

By Captain Rezty Felty, USS Dark Phoenix, R12

If you are not in Engineering, you may have given little thought to the Heisenberg Compensators. Well, they are an important component of every Federation ship, and it is good to know how disintegrating and reforming your body works every time you step on a transporter pad.

First, a little quantum physics lesson for those of you who slept through the courses at the Academy, or took the courses so long ago you've forgotten. Werner Heisenberg discovered an important and kind of creepy fact about the particles that make up all matter in the universe. His discovery was that the very act of observation causes the probable location or speed (but not both!) of any particle to collapse. The laws of quantum physics in our universe mean we can never know both the location and speed of any particle. This is known as the Heisenberg Uncertainty Principle.

So, how do we get around this to map the positions of every atom and particle in our bodies when we transport? I will remind those who didn't attend Starfleet Medical courses at the Academy that the human body contains more atoms than there are stars in our galaxy, and there are over 100 billion stars in our average spiral galaxy, the Milky Way. So mapping the position and speed of every particle in every atom of our bodies, all in the space of a few seconds, seems so daunting as to be impossible. Indeed, there were scholars back in 20th century Earth who swore that matter transportation was impossible. But they were left with egg on their faces (an old Earth expression), when Kansas University in Lawrence, Kansas, USA, successfully performed the first transport of an atom in the first decade of the 21st century.

One wonders, how do we in Starfleet get around this enormous challenge? The answer is quantum computers yoked to Heisenberg Compensators. How does that work? The Uncertainty Principle says we can never know both position and speed, and that the very act of observing causes probability states to collapse. In the 2120s, a brilliant physicist and engineer, Emory Erickson, made all we do possible. First, a word about quantum computers.

In the early days of computing, all systems were either binary or analog. We developed advanced cryptography that was estimated to take longer than the estimated age of the universe to crack. Those computers (and many we still use – ask the Binars!) used bits, each which could have a value of 1 or 0. In those days, computers were made faster and more efficient by increasing the bit density of the CPUs, which ultimately capped out at 64-bit processors.

Bundling more transistors on the chip substrate, packing them ever closely, and making them ever smaller, stopped around the 64-bit mark because to go smaller or pack them closer started to introduce quantum tunneling effects. The circuit paths, built on a nanometer scale using x-ray lithography, were just too small and too close together. On those incredibly tiny and dense chips, electron impulses could disappear, only to reappear simultaneously on nearby circuits. As one can imagine, having electrons spontaneously migrate to other circuits rendered all results from these computers suspect.



Thus, at the end of the 20th century, and the beginning of the 21st, scientists, chip designers and physicists began to experiment with quantum computing. And the game-changer of these systems was that instead of being able to be in only 2 states, like the binary bits with their one or zero states, quantum computers use

qubits, which can have any of 4 states: 1, 0, both, or neither. Processors using qubits could be built to use quantum tunneling, rather than fall victim to the effect. To put this into perspective, a 64-bit binary computer, state of the art at the time, was, as I mentioned early, incapable of breaking the most advanced cryptography of the time in any period less than the expected age of the universe. Yet, early quantum computers, 3 qubit and 4 qubit models, could break this cryptography in mere days, rather than trillions of years.



What does this have to do with the Heisenberg Compensators? It means we finally had computers that could accurately map every atom and particle in a human body in a short time. We have seen significant improvements in the technology between 2124 and now. Emory Erickson, the originator of much of this technology, said he was terrified when he first tried the transporter. In those days, it took about 90 seconds to map every particle in a human body. As it is important to keep all those minuscule particles as still as possible during mapping, those early models used a stasis field to hold the transportee absolutely still.

But even with advanced quantum computers to map the data, you still run up against the Uncertanty Principle. How can we transport a being with hundreds of billions of atoms and particles, if we are prohibited from knowing both location and speed?

Well, Emory was a very clever fellow. Much like the standard geometric solids we use to calibrate transporters these days, Emory experimented extensively with transporting inanimate matter long before attempting living beings. And he found the Uncertainty Principle to be his main

roadblock. But, in his perspiration and genius, he devised a method to get close approximations without causing probability fields to collapse. His method to get around this was the Heisenberg Compensators, another stellar invention from the father of transport.



We can't know the position and speed of any particle, it breaks the law. But his compensators take the data from the quantum computers, observes one of the states during the scan, and then uses the massive computing power of the quantum computer to estimate the speed. We have (and he had) done enough observations that we had a pretty good approximation of the speed of any given particle, without actually observing it. He drew his approximations closer and closer to what we knew to be the measured average speed of various particles.

When transports of inanimate solids started failing, he knew his 'margins' of approximate speed were drawing too close to the observable value. So in constructing his first Heisenberg Compensator, he set an approximation limit at double the range where transports started failing. And that's how the compensators work. They take the observed value of every bit of our body, add in a close approximation of the speed, and use that. They basically bypass the uncertainty principle by measuring one property, and making a very, very good guess at the other. At a macro scale, this looks like cheating entropy, using technology to thumb our nose at the universe.

But the takeaway is that it works, hundreds of years of transport use has shown it is safe 99.9% of the time, and we just accept it, and think no more of it (unless you are an engineer), than we do of the food that materializes when we ask it to.

The basics of electrical engineering

By Lt Col Michael Stelzer, USS Oklahoma, R12

Hello, I am Michael Stelzer, I have a Ph.D. and professional engineering license in electrical engineering. Over the next several issues of *Event Horizon*, I plan to give a quick crash course in electrical engineering.

Only the “bare bones” are presented in a simple manner so that even the non-technical person should be able to obtain a general idea of the technology. I hope that you enjoy it.

Simple electrical definitions:



Photo: John Sloan

Voltage (V) is the difference in electric potential between two points, which (in a static electric field) is defined as the work needed per unit of charge to move a test charge between two points.

Voltage is measured in volts and is represented by the letter V. Electric current is measured using a device called a voltmeter.

Current (I) in an electric circuit is electrons moving through a wire.

The unit of electric current is the ampere, or amp, which is the flow of electric charge across a surface at the rate of one coulomb (a coulomb is exactly 1/ (1.602176634×10^{19}) elementary charges) per second.

Electrical current is measure in amperes and is represented by the letter A. Electric current is measured using a device called an ammeter.

Resistance (R) of an object is a measure of its opposition to the flow of electric current. Its reciprocal quantity is electrical conductance, measuring the ease with which an electric current passes.

The unit of electrical resistance is the ohm (Ω), while electrical conductance is measured in Siemens (S) and then represented by ℧. The electrical resistance of a material is dependent upon its material type and its dimensions.

Ohm's law states that the current through a material between two points is directly proportional to the voltage applied across the two points. Ohm's law has the following three formulas:

$$I = V/R$$
$$V = I * R$$
$$R = V/I$$

Where:
I is the electrical current, R is the resistance, and V is the applied voltage



Explore Strange New Worlds with Region One Sciences!

ADM Richard Heim, R1 Regional Division Chief for Sciences

Star Trek has been an inspiration for science since its inception in the 1960s. The 60's was the decade of the Apollo Moon Program and I think Gene Roddenberry wanted his new sci-fi series to reflect the seriousness of the times so he hired a science consultant to make sure the sci-fi science in Star Trek had some basis in real science. And that was a huge draw for me in my high school years.



The Apollo 11 Saturn V lifts off from Kennedy Space Center. Photo: NASA

In fact, both the Apollo program and Star Trek, as well as an aerospace class in 8th grade, are what drew me to a career in science as a meteorologist.

But enough about me. Lots of folks in Region One, and indeed across STARFLEET, share my enthusiasm and interest in science.

Region One Sciences is one of the more active divisions in the region's division program. We have a web page and Chief Science Officer (CSO) Handbook. Some dozen or so R1 ships report regularly to Region One Sciences on their chapter science activities.

These activities range from guest speakers at meetings to away missions to nature and science centers to reports on the latest science news from around the world. You can read about the chapter activities on our web page.

Below are some recent activities that you may find interesting.

The USS Heimdal has had guest speakers from the Blue Ridge Astronomy Club, the National Oceanic and Atmospheric Administration (NOAA), and Stone's N Bones (a local rock/stones/geology shop) speak about their work.



Photo: NASA/JPL-Caltech

Science articles posted to chapter communications channels or reported at meetings by the USS Tanasi, USS Renegade, USS Alaric, and USS Ronald E. McNair include the James Webb Space Telescope, the June 3rd Parade of Planets, NASA's Starliner mission to the ISS, the nova explosion of T Coronae Borealis that will be a once-in-a-lifetime event, a Perseverance Mars rock sample may contain the best evidence of possible ancient life, the possibility that the clouds of Venus could support life, and snake robots (pictured).



Photo: NASA

The USS Jurassic, USS Ohio, USS Renegade, and USS Tycho were in or near the path of totality for the April 8 total annular solar eclipse; members observed the eclipse and provided reports. The USS Jurassic's CSO also attended the premier amateur radio convention in the United States called the Dayton Hamvention.

The USS Alaric has conducted away missions to the North Carolina Arboretum and Asheville Botanical Gardens.

The USS Potomac's CScO regularly reports on the latest NASA news, local astronomy club activities, and AAVSO (a variable star observing group) and Globe At Night info.

Science presents tremendous opportunities for exploration and discovery. Come join us as we explore Star Trek science and real science together!

Find out more about Region 1's science activities at **https://scienlaric.com/r1sci/R1Science.htm**

The Black Widow and the Regal



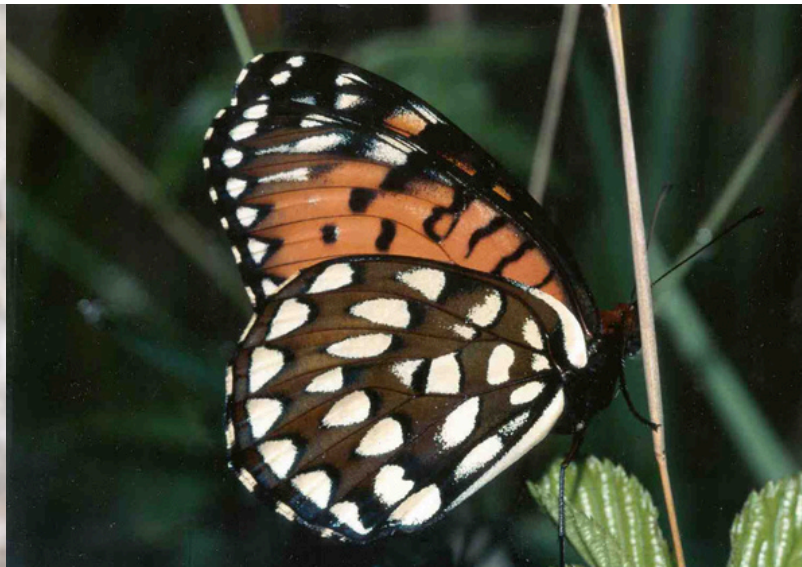
Taken from *The Amazing Adventures of a Midwestern Girl* by Barbara J Barton

Fort Indiantown Gap Military Reservation is a National Guard training center nestled in central Pennsylvania. It blankets Blue Mountain, which is part of the Ridge-and-Valley Appalachian Mountains, and drapes out into the valleys east of the mountain. It has been used as a training ground for U.S. troops since 1933. The land here is battered in some places and pristine in others, with spring-fed streams, dense mountainside woods, timber rattlesnakes, and a rare and beautiful butterfly called the regal fritillary.

I was once a zoologist with The Nature Conservancy and was blessed to have spent several years learning about this magnificent creature. Five summers, in temperatures sometimes over one hundred degrees *(38C)*, were devoted to sprinting through fields, tripping over hidden tank ruts, and dodging troops playing war games. All done with the goal of catching as many butterflies as possible and carefully writing a number on their wings so we could estimate how many there were and how far they flew.

I had been chasing and marking regals all morning, and as I made my way down a dusty tank trail, I noticed something flapping about in a clump of tall grass.





Upon closer inspection, the cause of the struggle became obvious – it was a male regal fritillary butterfly caught in a spider web unfamiliar to me. The fine strands seemed to be placed haphazardly between the blades of grass, creating a complex maze of silk.

As he continued to struggle to free the one wing that was stuck to the web, out from the deep, dark depths of the grass emerged a large female black widow spider. Spider paused and waited. When Regal tired and could no longer flap his wings, Spider moved in and attached the tip of a second wing to her web, then calmly retreated back into the grass.

For the next half hour, Regal gallantly attempted to free himself. But after about fifteen minutes, his movements would cease and out Spider would come, attaching another wing to her delicate web. When at last all four wings were secured and he could no longer move, Spider delivered a paralyzing bite to the underside of his body. She then, quite literally, rolled him up into a cigar-shaped bundle, starting at the tip of his wing. Once he was neatly packaged, she carried Regal down into the darkness of the grass. I returned to her web daily for the next week but never saw Spider or Regal again. The web? It vanished, too.

It was an odd feeling, watching this drama of nature unfold. Here was a butterfly so rare it was being considered for listing as an endangered species. Here was a butterfly that I had held in my hand only weeks earlier. Yet the black widow spider didn't care - she was hungry. Through this small window, Nature doesn't recognize rarity – a meal is a meal, plain and simple. But in the grand scheme of things, rarity causes shifts in our world, some we can see and some we can't. Shifts in the food chain. Shifts in processes. Shifts in quality of life.

What will our world be like without the polar bears and seals when the ice caps are gone? What did we lose when the passenger pigeons no longer graced the skies? I watch the clouds of red-winged blackbirds in the fall and can only imagine. There is an Indigenous teaching that says what we do the Earth we do to ourselves. Something to think about.







The Adventures of Stamets



SFSCI's tardigrade mascot Stamets has been getting out and about over the past few months.
He met some cadets at the start of the summer, who invited him to go on a fossil hunt with them. He was a bit surprised to come face to face with a dinosaur, but hey, he's a tardigrade, he can handle mass extinctions - dinosaurs are no big deal!

In July he joined R20 at the Destination convention in the UK, where he found some furry new friends. Some very interesting characters came by the SFI stand, including someone calling himself "Robert O'Reilly", but who Stamets' new friends assured him was a Klingon. Later on an android stopped by and gave Stamets a present, but when he was trying to figure out what it was he got two of his little legs stuck and needed to be rescued by the Deputy Director CPT Pam Kingsley.



After saying goodbye to his tribble friends, Stamets hopped onto a shuttle and headed across the pond to visit SFSCI's Director, FCPT Barb Barton, who has been off on sick leave. Stamets made sure to give her a quick cuddle and make sure she was being well looked after before boarding his shuttle again and heading off in search of more adventures...

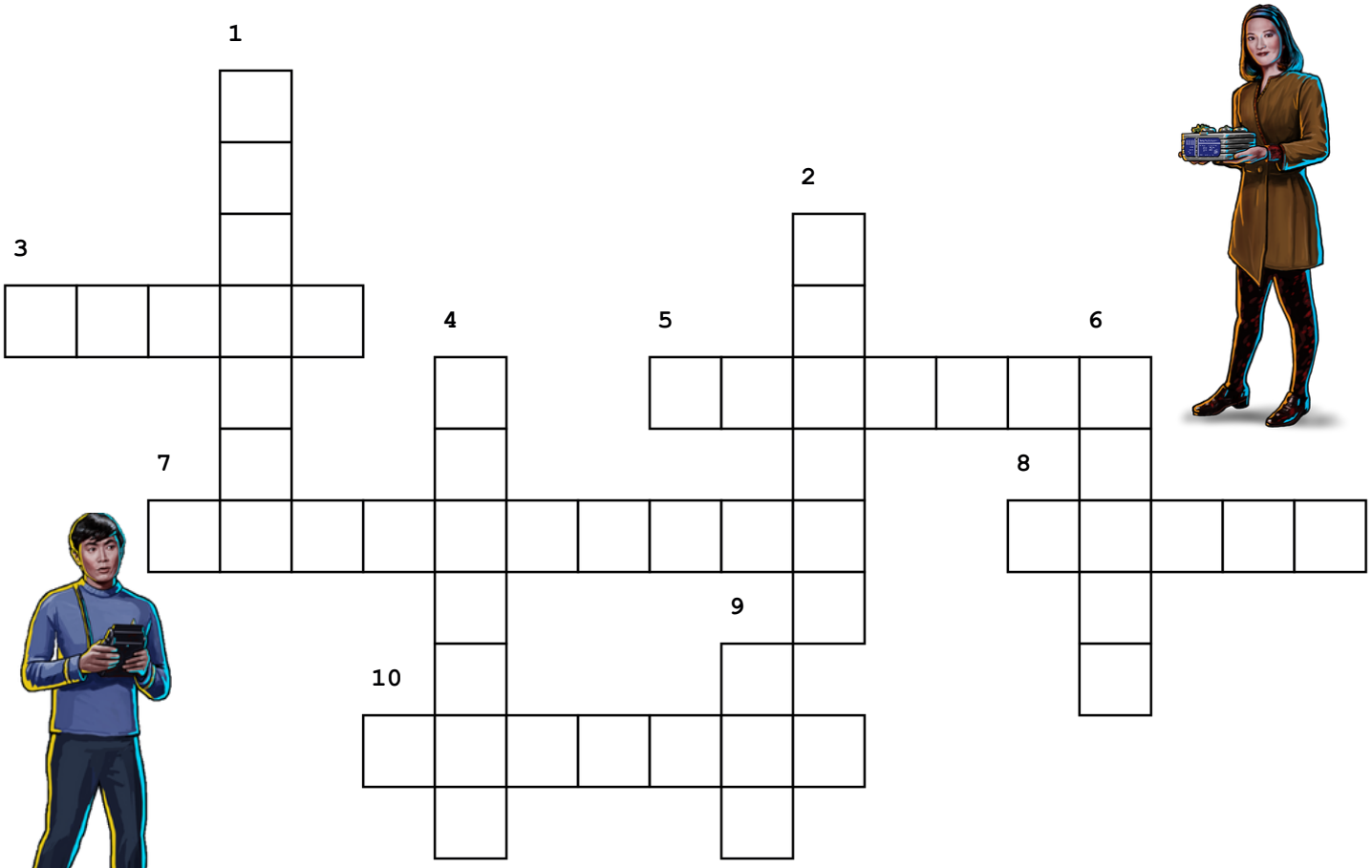
Colour Stamets

Get out your colouring supplies or graphics programme and bring Stamets, our mascot, to life! Is he exploring a jungle of moss? Next to a puddle ocean? Maybe he's climbing a pebble mountain?
Once you've finished, we'd love to see the finished picture. You can either upload it to the STARFLEET Sciences Division Facebook page or email it to **sfsci-eheditor@sfi.org** to be included in the next issue of Event Horizon. Make sure you get permission from your parent/guardian if you are under 18, and include your name and region.



Generated with AI/Copilot

Xenobiology quiz



Across

3. Which doctor kept a lot of animals in his sick bay?
5. What is the name of STARFLEET Sciences' mascot?
7. What is another name for a water bear?
8. Moopsy will drink your ____!
10. What species has a ridged forehead and duplicate organs?

Down

1. What very cold planet is Hemmer from?
2. What type of animals are George and Gracie?
4. What creature is small, furry and breeds rapidly?
6. Who was Captain Kirk's science officer?
9. What type of animal is Porthos?

Answers: 1. Andoria 2. Whales 3. Phlox 4. Tribble 5. Stamets 6. Spock 7. Tardigrade 8. Bones 9. Dog 10. Klingon

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