



STEM SPECTRUM

INNOVATION
Through Insight

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UNEXPLAINED HEAT-WAVE 'HOTSPOTS' ARE POPPING UP ACROSS THE GLOBE

Here's some exciting things that happened recently in the scientific community!

Welcome to this issue of the STEM Newsletter!

We are thrilled to bring to you the latest developments and groundbreaking research currently being conducted by the scientific community across the world. Each issue is dedicated to keeping you informed about the exciting discoveries, technological advancements and innovative solutions from all different fields of STEM. Our mission is to keep you updated on the ongoing in the complex world of STEM, in hopes of providing a platform where knowledge meets curiosity. We hope this issue helps you foster a deeper understanding of the world around you, inspire you to become the next generation of thinkers and innovators.

In addition to updates the newsletter will also explore the constant discussions of current scientific issues, offering nuanced perspectives on topics that are beginning to and will shape our future.

Whether you're a seasoned professional, an educator, a student, or simply someone passionate about STEM, there's something here for everyone. We hope you find this newsletter both informative and inspiring, and we look forward to exploring the world of STEM with you.

Enjoy this issue, and let's dive into the wonders of science together!

A handwritten signature in black ink that reads "Rosalyn C". The signature is fluid and cursive, with a large, stylized 'C' at the end.

In this newsletter you can expect:

Latest
Innovation in
STEM

Breaking
Research
Updates

Emerging
Technology

Industry
Spotlights and
innovations

Key Figures and
Discoveries

EUROPA CLIPPER LAUNCH!

On the 14th of October, NASA's Europa Clipper embarked on a journey to Europa, a moon with an "enormous subsurface ocean" that may be able to support life. From NASA's Kennedy Space Center in Florida, the SpaceX Falcon Heavy rocket was launched at 12:06 pm, being the largest spacecraft ever built by NASA for a mission headed to another planet, spanning 30.5 meters end to end and weighing around 5900 kg with propellants. The spacecraft will travel 2.9 billion kilometers with a trajectory leveraging the power of gravity- first to Mars in 4 months then back to Earth for another gravity assist flyby in 2026. After orbiting Jupiter in April of 2030, it will fly past Europa 49 times, getting as close as 25 km away. Using 9 scientific instruments, powered by the faint sunlight reaching Jupiter. These include an ice-penetrating radar and thermal sensors used to study the moon's icy shell, atmosphere and interior.

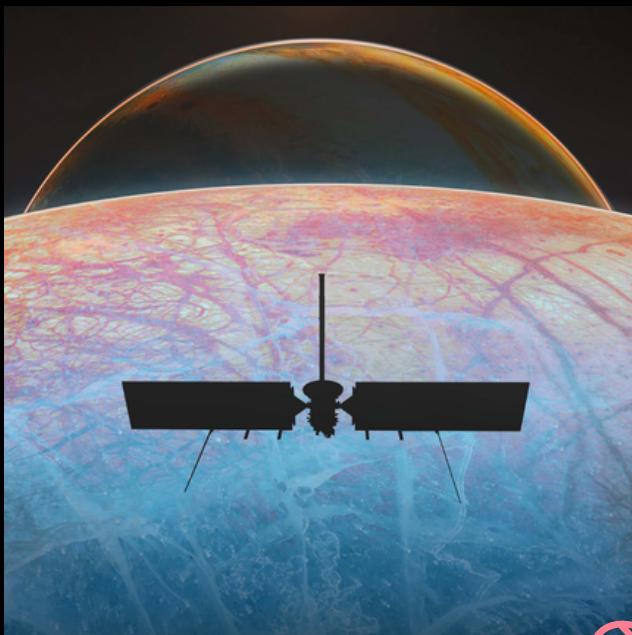


With the main goal of the mission being to determine whether the conditions on Europa are suitable to sustain life, this breakthrough will heavily impact the scientific community. Europa's size is approximately equivalent to that of our own Moon, with a different interior. Evidence has shown that beneath Europa's ice lies an ocean with more water than all of Earth's combined, furthermore, evidence has emerged that Europa may host organic compound and energy sources under its surfaces. If the mission is successful in determining the habitability of Europa, it may mean that the possibility of habitable world in our solar system is greater than imagined.

"NASA leads the world in exploration and discovery, and the Europa Clipper mission is no different. By exploring the unknown, Europa Clipper will help us better understand whether there is the potential for life not just within our solar system, but among the billions of moons and planets beyond our Sun."

The Europa Clipper's main objectives are to determine the thickness of the moon's shell and its interactions with the ocean below, to explore the composition and geology as well as the astrobiological potential for habitable worlds beyond the earth.

At around 5 minutes after liftoff, the rocket's nose cone opened to reveal Europa Clipper, later, at around 1 hour after the launch, the spacecraft separated from the rocket. At 1:13 pm ground controllers received a signal of two-way connection with NASA's Deep Space Network facility in Australia.



Research Updates: KO Ho Tin

Researchers from Columbia university have engineered probiotic bacteria used to educate the immune system to destroy cancer cells, opening a route for cancer vaccine research through taking advantage of the bacteria's natural tumour-targeting properties. The vaccine may be personalized to attack an individual's primary tumor or metastases and even help prevent future recurrences.

Studies were performed using mice with advanced colorectal cancer and melanoma, while in some cases the vaccine was used to suppress or eliminate the primarily and metastatic cancers, all while leaving the healthy part of the body alone.

While most of the current treatment provided through peptide- based cancer vaccines have been efficient, the bacteria vaccine provides the advantage its ability to "coordinately restructure and activate all arms of the immune system to induce a productive antitumor immune response." This allows for effective treatment with advanced solid tumor modules particularly difficult for conventional immunotherapies to treat. The main effect of the bacterial vaccine is to control and or eliminate the growth of advanced primary or metastatic tumors to extend the survival of the tested mouse models.

Through uniquely targeting each tumor, the integration of the bacteria vaccine in modern medicine and cancer treatment would be massively beneficial to the development of immunotherapy.

Whilst bacteria has been previously and is still used in cancer treatment, its precision has been limited. Currently being used to treat early stages of bladder cancer through naturally migrating and colonising tumors, especially in oxygen-deprived environments, the bacteria's ability to locally provoke an immune response has been a good starting point for researchers to build a "new domain of cancer therapeutics".

The new system uses a probiotic strain of the E.coli bacteria altered through genetic modifications to control the interaction of the bacteria with the immune system, controlling how it educates it to induce tumor killing.

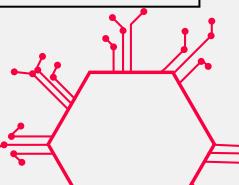
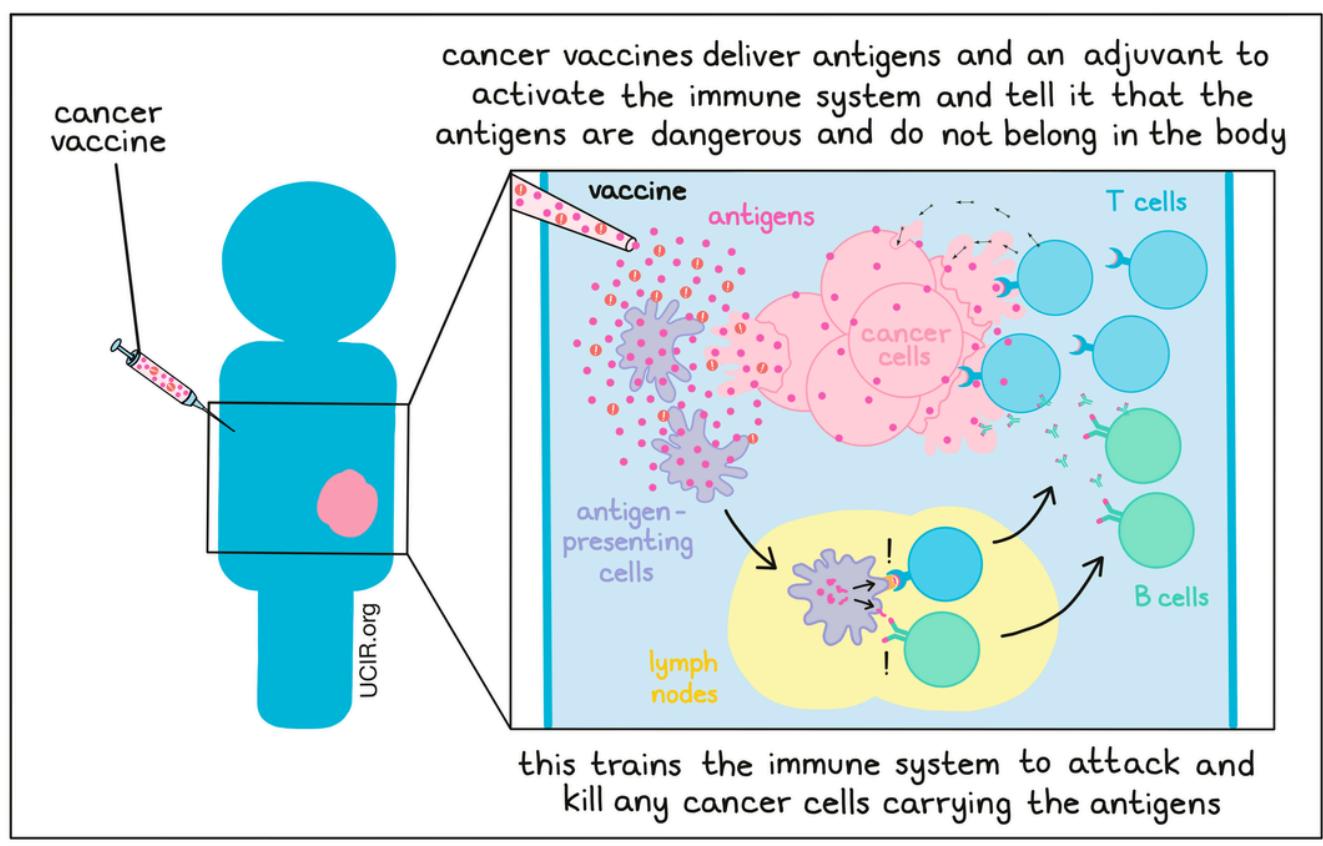


"Every cancer is unique -- tumor cells harbor distinct genetic mutations that distinguish them from normal healthy cells. By programming bacteria that direct the immune system to target these cancer-specific mutations, we can engineer more effective therapies that stimulate a patient's own immune system to detect and kill their cancer cells,"



The engineered bacteria encode protein target, known as neoantigens that are specific to the cancer being treated. These are delivered through bacteria to train the immune system to target and attack such cancer cells expressing the same proteins. To ensure that the normal body cells aren't affected, neoantigens act as tumor targets, making the treatment safer and more precise. Furthermore, the nature of the bacterial system and additional genetic modifications engineered by scientists, the bacteria cancer therapy may simultaneously overcome immunosuppressive mechanisms in tumors used to block the immune system. As a safety measure, the engineered bacteria are modified to be easily recognised and eliminated by the immune system if it fails to find the cancerous tumors.

When tested in mouse models, it was found that the bacterial vaccines can effectively recruit various immune cells that target and eliminate tumor cells while simultaneously inhibiting immunosuppressive pathways that would typically void anti-tumor responses. The bacterial vaccine has demonstrated its effectiveness in reducing tumor growth when administered to mice before they developed tumors, preventing the regrowth of the tumors in cured mice, suggesting the vaccine's ability to prevent remission in cancer patients.



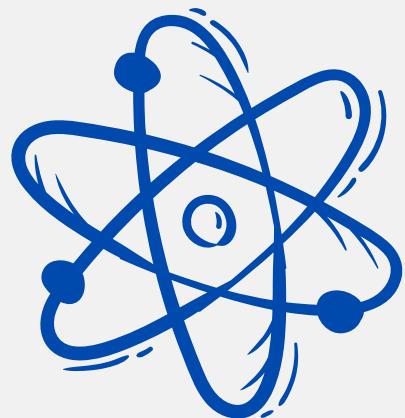


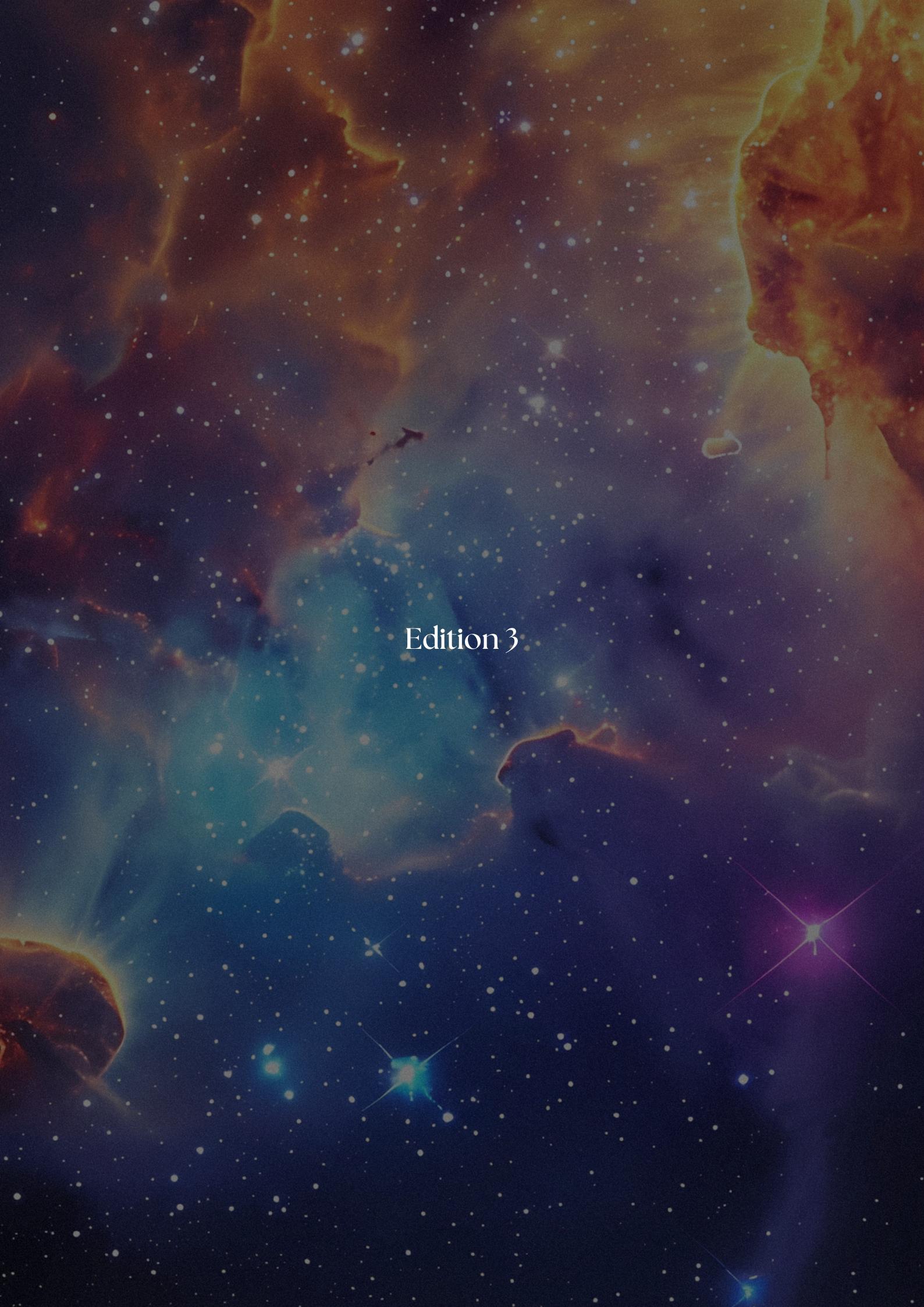
ALZHEIMERS
DYNAMITE
ENDOSCOPY
INTERFACE

MACHINE LEARNING
NITROGLYCERIN
NOBEL
OPERCULUM

POLLUTION
ROBOTICS
SYNAPSE

I have keys but open no locks,
I have space but no room,
I can enter but can't go outside.
What am I?





Edition 3