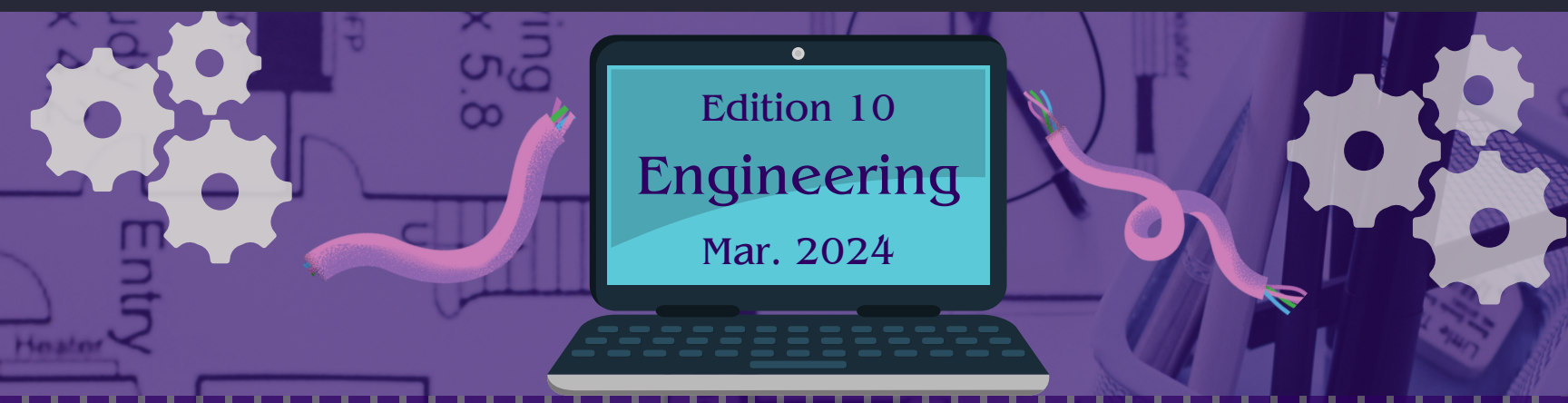
# The **STEAM-STEINETTES** Gazette




"YOU BRING GREAT VALUE FROM YOUR UNIQUENESS, AND IT ISN'T THE SOURCE OF YOUR WEAKNESS."

- Josephine Santiago-Bond

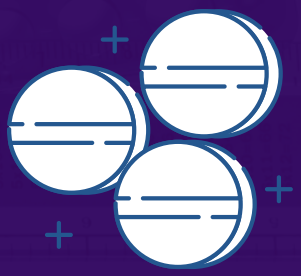
## The Significance of Orbital Transfers

**By: Hitej R.**

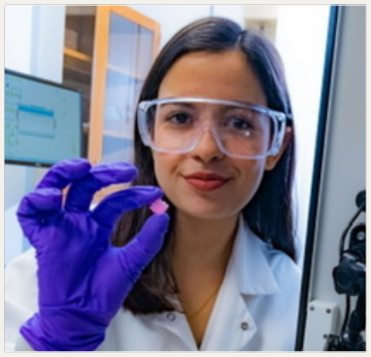
Have you ever wondered why the ISS doesn't come crashing back to Earth? Even if it did, it would accelerate slower than we do. Since it is further away from the Earth, gravity has less pull. But it's at a much higher altitude, which means that it would accelerate for a much longer time. To counteract this force of gravity, the ISS must have another force. As it moves, its velocity wants to keep it moving forward, but the Earth's pull curves it so that it makes a perfect circle. This is called centripetal force. Imagine how precise that velocity has to be! Too slow, and it could come crashing down, and too fast, lost in space! But how does the ISS manage to stay at the same speed? It doesn't! The ISS uses what's called a Hohmann transfer orbit to recalibrate its orbital path. As the ISS inevitably slows down due to air resistance (there's still a small amount of air resistance up there), its centripetal force decreases and it loses altitude. So as it slows down, its orbit becomes an inward spiral. At any point, the ISS has to fire its thrusters just enough so that it will cross paths at one point with the original orbit it wants to maintain. Additionally, instead of having a low velocity and moving inward, the thruster increases the velocity just enough so that it will stay in the proper orbit!

**Read on!**

# SCIENTIST SPOTLIGHT



**By: Bailey WR.**



**Maryam Elizondo**

When you think of the term “engineering”, what comes to mind? You most likely think of big buildings and bridges that you drive past daily. Well, people like Maryam Elizondo are breaking into a different type of engineering -- biochemical engineering. Elizondo was born near the Rio Grande Valley, and had a father that helped spark her interest in the biology field at a young age through textbooks he got from his medical school. A combination of her medically minded father and her encouraging physics teacher resulted in her branching out into biochemical engineering (NIH.gov).

She completed college prep courses through her high school, and eventually was accepted into Rice University. She started working specifically to help with the regeneration of important biological structures. Elizondo mentioned, “The vast majority of tissues in the body are soft. Only bone and—to a certain degree, cartilage—are load-bearing hard tissues. Because they are load-bearing, repairs have to be incredibly sturdy and mimic the natural tissue as closely as possible. We need to be able to implant a repairing scaffold that can regenerate bone and cartilage and in a configuration that matches the injured area.” She worked in labs with other classmates to create a type of 3D insert that would allow the live cells to continue to generate. The specific structure would also allow the cells to build up in, “successive layers—just like it is laid down in normal circumstances, for example, in the knee” (NIH.gov).

This hands-on experience allowed her to find her true passion, and help to narrow down what she wanted her future to be like, which was something she struggled with when she was first accepted into Rice University (NIH.gov). Elizondo wants to be a mix of a biochemical engineer and a medical doctor of some sort. She knows going into a field that is mostly made up of men and made up of even fewer minorities, she will have a challenge, but she is determined. Currently, Maryam Elizondo is starting the Medical Scientist Training Program, and with so much passion already, who knows what she will do in the years to come?

# Science Experiements

**By: Sofia J.**

Easy

## Catapult Experiment

For this experiment, you will need craft sticks, spoons, and rubber bands. Start by taking 5 sticks, stacking them, and securing one end with a rubber band. You will need to wrap the rubber band around a few times to keep the sticks in place. Slide one additional stick between the bottom stick and the other 4 sticks. Secure the other end of the stack with a rubber band. Repeat the wrapping process. Place the spoon on top and attach the end of the spoon to the end of the single stick with a rubber band. Grab a small item to fit into the spoon, pull it back, and watch it go.

**CLICK HERE FOR THE STEPS!**

Medium

## Robotic Hand

To complete this experiment, gather tape, scissors, cardboard paper or cardstock paper, standard drinking straws, pearl drink straws or bigger diameter straws, and yarn or twine. First, trace your hand on the cardboard or cardstock paper and cut around the sketch. Be sure to cut a little bigger than the actual tracing. Next, mark your finger joints and draw straight or curved lines across it. Then, fold the fingers at the lines, cut smaller straws to size (leave a small gap between the lines), and tape straw pieces to the hand. Finally, thread the yarn through the straw pieces and thread all 5 pieces of yarn through the bigger straw. And there you have it, a robotic hand.

**CLICK HERE FOR THE STEPS!**

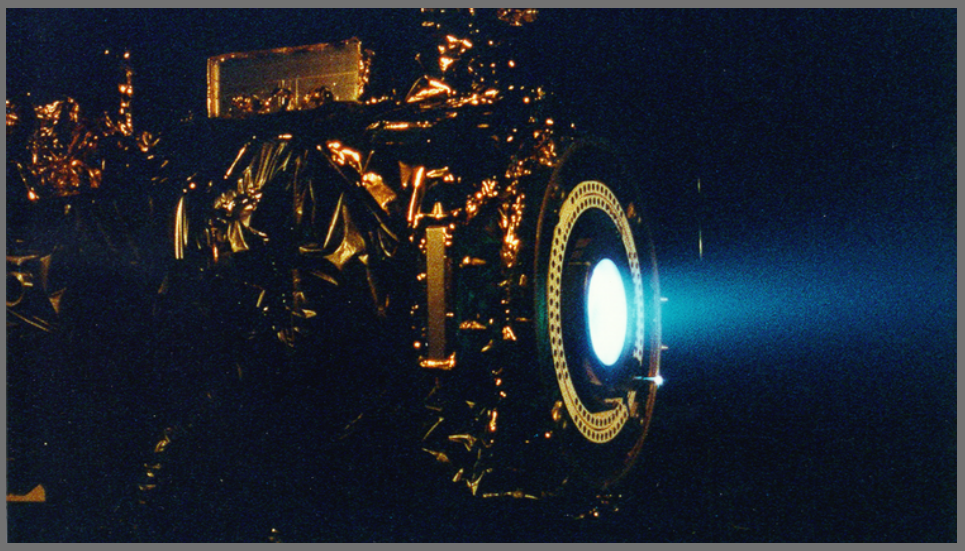
# World Science News

**By: Hitej R.**

On February 2nd, 2024, the Apple Vision Pro, Apple's first spatial computer, confirmed that full immersion of computers and reality is the future.

On November 18th, 2023, SpaceX tested their Starship for the second time, which will eventually be used for carrying people all the way to Mars.

On November 30th, Tesla delivered the 1st Cybertruck to pre-orders. It has one of the strongest exteriors of any car, made from all stainless steel, and a motor that can go from 0-60 mph in 2.6 secs.



# ION PROPULSION ENGINES

By: Ace M.

Have you ever seen a rocket launch? As soon as the countdown hits zero, all hell breaks loose as the titanic thrusters of the behemoth structure begin to spew out explosive chemical exhaust at incredible speeds to achieve lift-off from the ground, producing thundering noise and massive clouds of gas that engulf the soaring rocket as it perseveres through intense atmospheric drag and finally makes its way out of Earth's protective cover. It's tempting to think that all rocket thrusters are like that—heavy, conspicuous, devastatingly powerful, and, more importantly, chemical-based (i.e., relying on chemical reactions for thrust). And for a while, that was the case. But in recent decades, advances have been made to develop a new kind of thruster that doesn't rely on traditional chemical reactions, requires only a fraction of the mass of chemical rockets to work, and has the potential to enable deeper space missions (NASA, par. 1): the ion thruster.

Ion propulsion is a relatively simple concept. Instead of relying on oxidizing reactions to provide thrust, the ion thruster ionizes the atoms of a gas (usually a noble gas, such as xenon or argon), accelerates individual ions magnetically, and expels them at incredible speeds out the back. Electrons are also ejected after them to neutralize the ions (NASA, par. 2-7). There are two main kinds of ion thrusters: gridded ion thrusters and Hall thrusters. The main differences arise in their specific impulses (i.e., the mass-to-fuel ratio, which means how much less fuel you need to carry to burn) and thrusts caused by technical and design differences. Generally, Hall thrusters provide larger thrusts while gridded ion thrusters provide higher specific impulses and require less fuel ("Why Are There Two Different Types of Electric Space Engines," 04:02–04:15). In both types, the speeds of exhaust achieved are much higher than the speeds of the exhausts of chemical rockets, but, despite this, ion thrusters of any kind only provide a small fraction of the thrust of traditional rockets due to power requirements and are therefore only currently limited to powering small spacecraft, like NASA's *Dawn* spacecraft (NASA, par. 9).

Still, they offer a greatly promising future for spacecraft propulsion—perhaps not to leave the atmosphere (we will probably still be using solid-fuel rocket boosters for that, since they provide the tremendous thrust required), but for later stages of rocket flight.

# Hidden Figures

MOVIE REVIEW | BY: STEPHANIE A.

*Hidden Figures* is a film adaptation that explores the underappreciated achievements of brilliant African-American women mathematicians and engineers at Langley working to help the launch of astronaut John Glenn into orbit. This flight was very important, as it would show the world that America was a serious participant in the space race against the Soviet Union. This movie carefully intertwines issues of racism, sexism, and perseverance into the stories of Dorothy Vaughan, Mary Jackson, and Katherine Johnson. It adeptly demonstrates the challenges they faced, including workplace segregation and the struggle for recognition. Not only does it highlight their breakthrough achievements in aerospace engineering, but it also showcases their resilience in the face of adversity. If you like movies about space, engineering, mathematics, and history, I recommend you watch this movie and discover the untold stories behind some of NASA's greatest achievements.

Movie


**Review Rating: 5/5**

# Fantastic Facts!

**By: Jasmine P.**

This The term "Aerospace Engineering" first appeared in the 1950s.

A Boeing 747, one of the largest commercial aircraft models, has over 6 million different parts.

Aerospace engineering careers are in high demand.

# Meet the Team

A STEAM Club + The Einsteinettes collab

Durga I.

Ace M.

Sofia J.

Hitej R.

Bailey WR.

Stephanie A.

Jan P.

Diana S.

Vasilisa B.

Jasmine P.

Special thanks to our awesome advisors, Ms. Cristen Jones and Mr. Chad Hamblin!

Not mentioned: Quote provided by Jasmine

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