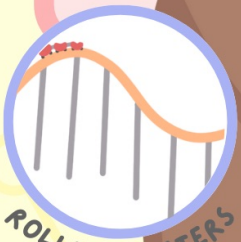
ISSUE 06

SWEET PHYSICS

EXPERIMENT

CHIEN-SHIUNG WU



ROLLER COASTERS

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Dear Readers,

Welcome to the sixth issue of SWEET!

Are you ready to explore the fascinating world of physics?

This issue is all about how things move, how forces like gravity work, and how energy helps things happen. We'll learn everything from why balls bounce to how roller coasters go so fast. Physics is the science that explains how the world works, and it's super fun to learn about!

I'm so excited for you to read, discover, and enjoy!

Happy exploring,

Chloe

STEM Exploration

PHYSICS IS FASCINATING

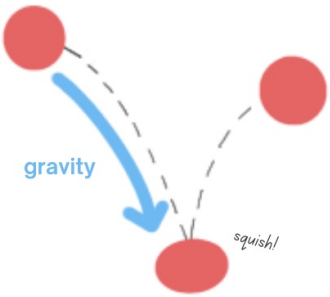
Do you ever wonder why a ball bounces back up when you throw it on the ground? Or why you don't float away when you jump? That's all thanks to **physics**, the science that helps us understand how the world moves and works!

WHAT IS PHYSICS?

Physics is the study of **matter**, **energy**, **motion**, and **forces**. That might sound tricky, but it's really about asking questions like: Why do things fall? How do objects move? What makes something speed up or slow down?

Did You Know?

Without physics, we wouldn't have roller coasters, airplanes, or even simple toys like swings!



Let's go back to that bouncing ball. When you drop a ball, **gravity** pulls it down to the ground. But when it hits the floor, it squishes a little and then pushes back, sending the ball back into the air! That's energy changing forms, from motion to squish to motion again. Physics helps us understand every part of that bounce.

If you've ever played sports, ridden a bike, or even tossed a toy, you've experienced physics in real life. You already know more than you think!

LIFE OF A PHYSICIST

Physicists are scientists who study **how the world works**. Some work with tiny atoms and particles, trying to understand what the universe is made of, while others study things like light, sound, electricity, or gravity. Physicists help build safer cars, design better video games, send rockets into space, and even help doctors with medical machines.

Physics is truly *everywhere* from roller coasters and rainbows to music speakers and microwaves.

Next time you bounce a ball, ride in a car, or look up at the stars, remember this: physics is working all around you. One day, you could even become the physicist discovering how it all works.

Experiment

BALLOON ROCKET SCIENCE

By Melody Alduy-Berman

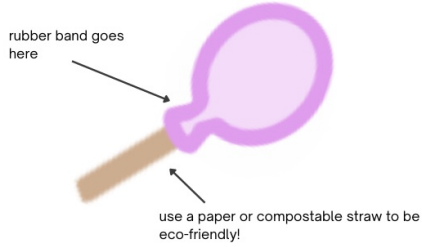
Have you ever thought about what makes a rocket launch into space? Make your own balloon rocket and explore the physics behind Newton's Third Law. Ready to see your own creation zoom across the room?

MATERIALS

- Colored balloons
- String
- Straws
- Tape
- Rubber band
- Black marker (optional)
- Scissors
- Colored/tissue paper

1 Preparing your rocket

- First, blow up your balloon to stretch it out.



- Then, slide your straw through the opening of the balloon.
- Wrap a rubber band around the opening of your balloon to keep the straw in place.

2 Setting up your launch line

Next, thread a piece of string through another straw. Tie each end of the string to two things that are a similar height (chairs, table legs, or doorknobs work well). Make sure the string is pulled tight and straight!

3 3, 2, 1, Blast off!

- Blow through the end of the straw to inflate the balloon! Make sure to carefully pinch the end of the balloon so it doesn't deflate.
- Once your balloon is inflated, ask a friend or parent (it's always better to have fun together!) to help tie the straw with the string to the top of the balloon with tape.
- Bring your balloon to one side of the string and let go: watch your balloon rocket zoom across the string!

TIME TO DESIGN!

To decorate your flying rocket, you can use colored paper to make flames! Just follow these simple steps:

1. Use your scissors to cut pieces of colored paper (choose your color: your flames can be red, orange, or purple, or even green!) that are about 15 cm long and about 6 cm wide!
2. Then, cut strips that are about 1 cm wide down one side, to make a fringe. Attach your flames to the end of the straw on your balloon!

You can also use your marker and draw designs on the balloon! Paint a window on one side of your balloon to make it look more like a rocket. Or even draw the rocket on the balloon! After decorating it, let your rocket deflate but be careful where you put it because the marker can smudge easily.

CHALLENGE YOURSELF

Looking for some more fun? Try making your rocket without the string and launching it from the ground (it is normal that your balloon will spin in circles as it rises into the air)! How high can it go?

Try making TWO rockets so you can race with your friends (you can use two different balloon colors and make teams)! Can you beat your friend's rocket?
What do you think makes your rocket go farther? Faster?

This is what we call **Newton's Third Law of motion**: for every action there is an equal opposite reaction! In simple terms, as the air escapes the balloon through the straw, the balloon becomes smaller and the air is pushed out **backwards**! This makes the balloon move in the opposite direction: **forward**.

Women in STEM

THE FIRST LADY OF PHYSICS

Chien-Shiung Wu

1918–Present

By Aleena Wong & Chloe Drieu

You have probably heard of Marie Curie: French physicist who researched radioactivity and has left a lasting impression for generations. But have you heard of Chien-Shiung Wu? She is often referred to as the “Chinese Marie Curie” and was a leading Chinese-American experimental physicist from the 1940s to the late 90s. Her work shifted common scientific understanding and inspired generations of scientists all around the world.

HER STORY

Chien-Shiung Wu (1912-1997) grew up in a small village right outside of Shanghai, China. She attended an all girls school founded by her father and loved learning so much that she graduated top of her class at National Central University in NanJing. Driven by her passion for physics, she travelled across the ocean to study at the University of California Berkeley in 1936. She later earned her PhD under the direction of Ernest Lawrence.

During World War II, Dr. Wu joined the top-secret Manhattan Project and used her science skills to help improve the process of separating isotopes of uranium to be used in the atomic bomb.

"Science knows no country, because knowledge belongs to humanity, and is the torch which illuminates the world."

Dr. Wu's most famous work was done in the 1950s when she taught at Columbia University. She dreamed up a genius experiment to test if the laws of physics were the same for matter and anti-matter (otherwise known as 'parity'). She found that in certain cases the universe does have favorites and does not always treat left and right equally! This discovery rewrote textbooks and changed the way scientists thought, however, her two male colleagues were the ones awarded a Nobel Prize in Physics.

Despite facing gender and racial barriers, Dr. Wu was determined. She became the President of the American Physical Society, a published researcher, and teacher at top universities like Smith College, Princeton University, and Columbia University.

LEGACY

Chien-Shiung Wu was a science superstar who proved that anyone can change the world. With her persistence and hard work, she conducted experiments that made scientists rewrite the laws of physics! Dr. Wu also won many awards like the inaugural Wolf Prize in Physics, the National Medal of Science, and got elected to the American Academy of Arts and Sciences. Ultimately, she has shown that talent and determination matter more than barriers or stereotypes, and has inspired generations of young girls.

Fill in the Lab

Grab a pencil and a friend! Fill in the blanks with the type of word asked for (before reading the story). Then read it back for a wacky lab adventure!

1. Physics concept: _____
2. Type of material: _____
3. Number: _____
4. Unit of measurement: _____
5. Scientific tool: _____
6. Type of motion: _____
7. Silly object: _____
8. Sound effect: _____

Today in the physics lab, we decided to test how (1) affects different objects. We grabbed a (2) ball and dropped it from (3) (4) high. Using a (5), we carefully measured its (6) speed.

Then, something unexpected happened: instead of landing, the ball bounced onto a (7) and made a huge (8)! Our experiment might not have gone as planned, but at least we discovered a new kind of physics: the science of silliness.

Lesson

THE SCIENCE BEHIND Roller Coasters

Roller coasters zoom, twist, drop, and loop, leaving us screaming and smiling. But did you know that every turn and thrill is carefully designed using science? That's right: roller coasters run on physics!

Hold on tight, let's break it down.

WHAT MAKES IT GO?

Most roller coasters don't have engines that keep them going the whole time. Instead, they start with a big climb up a hill. A motor pulls the train to the top, giving it **potential energy**. That's stored energy, like a stretched rubber band waiting to snap.

Once the coaster reaches the top, **gravity** takes over. Gravity pulls the train down, changing the stored energy into **kinetic energy**, which is the energy of motion. That's what sends the coaster speeding down the first drop, and through every loop, twist, and turn after that!

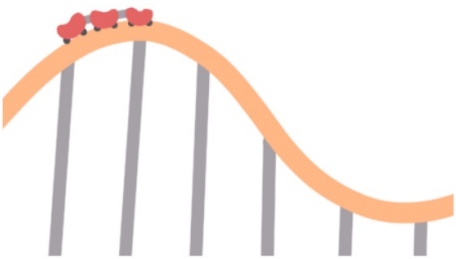
You may be thinking: why don't people fall out? It might feel like you're flying out of your seat on those fast drops, but you're safe thanks to **inertia** and safety harnesses. Inertia is a fancy word for how things want to keep moving the way they already are. So when the car turns or drops quickly, your body still wants to go straight, which is why you feel pushed to the side or lifted. The coaster's seat belts and bars keep you safely in place.

Engineers and physicists design roller coasters to make sure they're both fun and safe. They use math and science to figure out:

- How tall the first hill should be
- How fast the coaster will go
- How strong the forces will feel on your body

They also test everything many times before anyone gets to ride.

THE THRILL OF SCIENCE



Now for next time you're screaming through a loop or racing down a hill, you know you're riding a real-life science experiment! Physics makes roller coasters possible, and the better we understand it, the more thrilling (and safe!) the rides can be.

THANK YOU!

CONTACT US!

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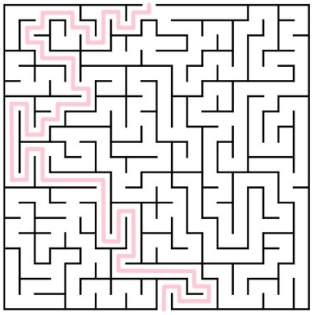
ABOUT

SWEET (Science with Exciting Experiments & Tips) is a zine that aims to spark curiosity and empower the next generation of girls in STEM through hands-on experiments, fun lessons, and games.

SOLUTION



OUR TEAM

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