



The Rocket Report

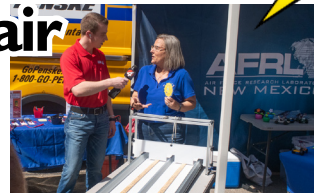


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Ellie Electrifies STEM Day at the Fair

It was a warm, sunny day at the Expo New Mexico Fairgrounds on 16 September 2022, also known as Science and Technology Day at the Fair.



Hundreds of visitors toured the booth with Ellie the Electron and her friends, who were busy moving around helping us power a Van de Graaff Generator, Solar Cars, and more, with the help of the Sun and some solar panels.

Protons tend to stay rooted where they are, but it doesn't take much to get Ellie and her electron friends to wander off, and then the lonely protons left behind start calling for *more* electrons to *charge* in and take their place. This constant rotation of electrons is what gives us the electric *current* to *power* our things.



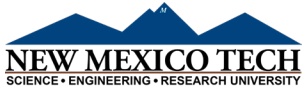
Thanks, everyone, for spreading some sunshine at our booth!

KOB-TV4 meteorologist Brandon Richards and his crew even stopped by for an interview or two! We got a *charge* out of that, Brandon, thanks!

Visitors discovered that atoms have protons, neutrons, and electrons. Atoms like to keep the amount of their *protons* and *electrons* equal.

Solar panels have a two-sided coating. When the sun excites the electrons, Ellie and her friends travel along the panel until they make their way back to the lonely protons, providing electricity for items like our solar cars along the way.

In partnership with:



Collaborator:



Remember, Teachers:
It's never too early to make bussing arrangements for our classes and events!



Welcome to National

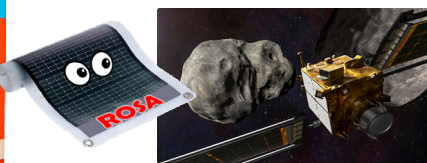


EVERYTHING
PUMPKIN SPICE
MONTH



HAPPY HALLOWEEN

DART Took ROSA



Students and visitors exploring our solar booth at the NM State Fair received "sun cards" with QR codes like the one on the right.

It links to a video discussing *ROSA*, the Roll-Out Solar Array that AFRL's Space Vehicles Directorate helped develop.

ROSA is a strong, lightweight, compact, modular, high-performance solar array that rolls up like a carpet



for easy spaceflight transportation.

ROSA has already been field-tested in space aboard the International Space Station.

And when NASA's *DART* probe reached its' target asteroid recently, it got there with the help of some *ROSA* solar panels!

That *ROSA*, she really gets around.

New Staff Rises Up



Megan "Phoenix" Rockstroh, from Arizona, is one of our newest DoD STARBASE classroom assistants. As the spouse of an Air Force *rockstar*, she frequently finds herself adapting to new challenges like a phoenix rising from the flames.

She has prior teaching experience working with autistic students, and loves watching *our* students' excitement learning new concepts and accomplishing goals in STEM.



The Most Metal Mission Ever

Background

As early as July 2023, NASA's *Psyche* satellite orbiter is planned to launch to an asteroid called "16 Psyche" in the asteroid belt between Mars and Jupiter. "16 Psyche" is theorized to be the nickel-iron core of what may have been an early planet in our solar system!

The *Psyche* satellite orbiter's mission is twofold:

1. Examine the metallic composition of the *Psyche* asteroid using a variety of instruments, as this asteroid may be representative of early planet formation; and
2. Test the onboard Deep Space Optical Communications (DSOC) laser for distances up to 2.5 astronomical units (AU), or about 232 million miles, transmitting to the Palomar Observatory in California.

Mission Objective

Each year, the STEM Academy develops a new objective for the simulated trip to Mars, based on real-world space exploration.



For this year, Mission to Mars scientists and engineers want to support the *Psyche* mission from a colony on Mars, so they have undertaken the **Mars Exploration and Transmission Laser (METL) Mission**.

As the *Psyche* orbiter approaches Mars, scientists plan to aim a pulsed Mars-based laser at the *Psyche* asteroid, creating a plasma trail which the *Psyche* Orbiter's instruments can detect and analyze, expanding the types of

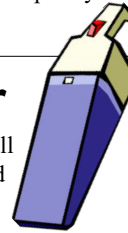


Your **commitment** to this mission is crucial to its success

data that the orbiting satellite can collect about the asteroid.

Additionally, using a Mars-based telescopic laser relay, scientists can receive transmissions from the *Psyche* orbiter's DSOC laser, amplify them, and relay them on to Earth, creating a stronger signal for Palomar Observatory to receive.

Fifth grade students participating in the 2022-2023 METL Mission to Mars will plan and build the colony of necessary long-term facilities and life support resources, and present them at the culminating Link-Up Day event in the spring.



Dustbuster

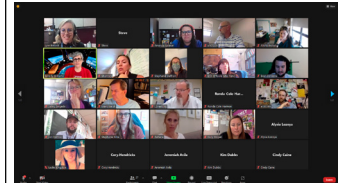
By mixing small amounts (around five %) of simulated Martian regolith (surface dust) with titanium alloy, using a high-powered laser, researchers at Washington State University have concluded:

It should be possible to use actual in-situ Martian regolith to 3D-print solid, usable tools on Mars.

See www.talker.news/09/19.

Returning, New

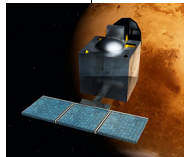
Returning Mars teachers were welcomed back with virtual open arms during a Zoom Returning Teacher Training refresher course on **Tuesday, 27 September 2022**.



Teachers *new* to the Mission to Mars completed *in-person* training for new teachers at our facility on **Wednesday, 12 October 2022**.

MOM Died

India's Mars Orbiter Mission (MOM), India's first trip to Mars, accomplished on their *first try*, is believed to have run out of fuel earlier this month and "attained end-of-life."



Built for a six month mission, it lasted *eight years*, studying atmospheric gases and Martian dust storms. See www.space.com.



Rocket Building

To build a rocket, students don't have to take out a second mortgage on their house. They don't even have to *build* a house.

TECH Mission Day 1 middle school students build four foot tall rockets that they can launch themselves when they meet up at the rocket launch site for TECH Mission Day 2. They use plastic and metal components to assemble the *booster tube*, *payload*, and *motor mount* sections of the rocket.

The components are provided to them for *free*, so they don't even need to take out a loan to get them.

Students choose their *rocket*



name from options such as *Gemini*, *Atlas*, *Apollo...* and *Phoenix*. Apparently, our staff is naming themselves after TECH Mission rockets now. I call *Apollo!*

They simulate and predict its flight with some math and a software program called *RockSim*, familiarize themselves with GPS units, and build *straw rockets* without hurting any camels' backs. Build, backs better!

Teachers, if weather looks bad on launch morning (**18 October 2022**), verify launch is still a "Go." **Call the Rocket Launch Hotline at (505) 401-5456.** *Note:* Our office is *closed* on Rocket Launch Day. We'll all be out at the launch site!

When getting ready that morning, consider the desert environment: It can start off kinda chilly and get warm later, so wear weather appropriate **layers**. **Students wear their red T-shirts.**

Sunscreen and **sun hats** aren't a bad idea, either. Launching rockets in the desert is thirsty work, so bring

some **bottled water**. Protect your feet from things they might meet:

Bring appropriate desert **footwear**. Shoes and boots are better than flip flops and sandals. And, very important: Remember to bring **lunch** for the **launch!**

At the launch site, **safety first!** Teams monitor weather and wind conditions, making sure the wind doesn't huff and puff too much. Teams stay in assigned areas, and *everyone* stands during launch, even spectators.



J.R. EWING

SUN HAT

BOTTLED WATER

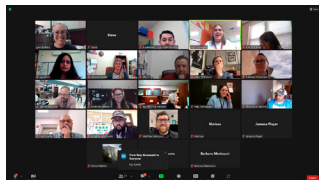
By the Tuesday of the week before the first class in the series, session, or semester, we will ask you for the name, driver's license number/ state of issue, date of birth, and the FULL Social Security Number, of every adult coming through the base gate for that series of classes.



Robotics Challenge For Middle Schoolers

Orientation and Programming

On 29 September 2022, some very human (or at least very human *looking*) coaches attended a Robotics Orientation session in the most high-tech way possible:



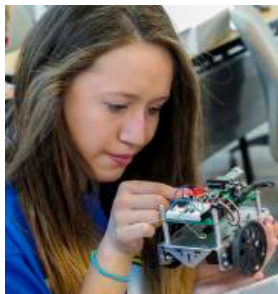
Over a Zoom meeting.

The coaches zoomed through the basics of the *Robotics Chal-*

lenge mission, in which students explore the basics of systems engineering, computer science, and robotics by assembling and programming small robots to complete tasks.

This mission culminates in a **Robotics Expo** event, scheduled this school year for **Friday, 12 May 2022**. The top 30 qualifying student teams demonstrate what they have learned through robot performance, team creativity, and a Quiz Bowl game.

Along the way, students explore



topics such as *Systems, Computers, Binary Math, Electronic Circuits, Python Programming, Micro:bit Microcontrollers, and Robotics*.

The tasks are broken up into four distinct **modules**, found on the

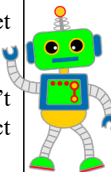
Canvas site:

- Introduction to Programming,
- The Micro:bit microcontroller,
- Robotics, and
- Robotics Expo readiness submissions.

Gotta robotically, methodically complete *one* module before going on to the *next* one.

The first module, **Introduction to Programming**, closes in mid-November, so have students get those for-next loops looping!

Questions? Suggestions? Don't just sit there like a robot! Contact lynn@afnlnewmexico.com!



STEM Challenge For High Schoolers

Team Name and Logo

Suggested Timeline:
Oct/Nov

Think about the STEM Challenge you are working on and the qualities each member of the team possesses.

Decide on a team name, develop a logo to represent your team, and create an electronic version of that logo.



Teams submit *three* documents to the Canvas website for points:

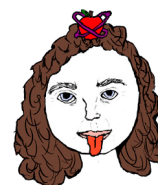
1. A document with their team member names,
2. A document with their team name, and
3. The electronic version of the logo they made.

Like This, See?

Here's some examples previous STEM Challenge teams have submitted.



Team 20--
Nerd Herd



Team 22--
Newton's Nemesis



Team 17--
Tigerpulters



Team 19--
Tigerseye



Team 21--
Small Fries

NUCLEAR EGGS



Team 23--
Nuclear Eggs



DoD STARBASE NM For Fifth Graders

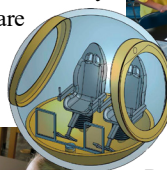
Rootin' for Newton

In DoD STARBASE NM Day 2, Physics, students are having a ball.

Otto's Gyro



Otto works at a factory manufacturing "gyrosphere" modular transportation cockpits, with help from his robot assistant, Gary.



Using the magic of *On-shape* 3D Computer Assisted Design (CAD) software, DoD STARBASE NM Day 2 students help Otto and Gary get the next gyrosphere ready for delivery!

Rootin' for Newton

Students are rootin' for Newton when they test out his laws of motion with Newton's Cradles and some fast-moving tablecloths.



MARVIN THE MARTIAN

Bussing tables was never so easy.

Fizz Whiz

In the Pop Goes the Fizz activity, students make an Alka-Seltzer-powered rocket to test how much fuel they need to reach a minimum height. Then they graph the results on their tablet.



Whiz Biz

Students enter the whiz biz with CO₂-powered dragsters.

When the students race the little dragsters,

shaped like little triangular wedges of cheese, it looks like the great Indianapolis Cheese Whiz 500!



By the Tuesday of the week before the first class in the series, session, or semester, we will ask you for the name, driver's license number/ state of issue, date of birth, and the FULL Social Security Number, of every adult coming through the base gate for that series of classes.



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<https://www.youtube.com/channel/UC-QuOSd1XTkYuXPONZwIAIHQ/videos>

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Mr. Steve Burke, Technical Writer.

Important Terms and Acronyms

AF: Air Force

AFB: Air Force Base

AFRL: Air Force Research Laboratory

AFRL NM: AFRL New Mexico (AFRL/RD and AFRL/RV), on KAFB

AFRL/RD: The Directed Energy Directorate of the AFRL

AFRL/RV: The Space Vehicles Directorate of the AFRL

DoD: Department of Defense

KAFB: Kirtland Air Force Base, Albuquerque, NM

METL: Mars Exploration and Transmission Laser Mission 2022-2023

MM: Mission to Mars

S&Es: Scientists and Engineers

STEM: Science, Technology, Engineering, and Math

TECH: Technology and Engineering Challenges

USAF: United States Air Force

USSF: United States Space Force

Remember, Teachers:

Get those EPA Modification forms in!



Birds In the Air

STARBASE 2.0 has birds in the air!

With the help of some mentors, Albuquerque Institute of Math and Science (AIMS) students launched the first wave of STARBASE 2.0 rockets this year on 30 September 2022.

One team was even already working with a *The American Rocketry Challenge* (TARC) compatible rocket.

We also test-launched a TECH Mission "Hamburger and Flies"



THE AMERICAN ROCKETRY CHALLENGE

rocket for their TECH Mission rocket launch coming up on 18 October 2022.

The good news: It can be said that their rocket flies. The bad news: It didn't come back down with any hamburgers. I was hungry, dang it!

Albuquerque School of Excellence (ASE) and Del Norte High School (DNHS) were a few days behind them, ready to launch their own 2.0/3.0 rockets.



By the end of this month, we'll have gotten so many birds in the air, *real* birds will have to fly south for the winter in the fall.



STEM Bytes

STEM Pathways Open

Registration for STEM Santa Fe's STEM Pathways for Girls (SPFG) 2022 Conference, on Saturday, 5 November 2022, 8:30-3:30, at Santa Fe Community College, is now open!



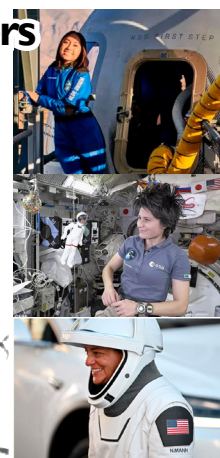
At SPFG, about 150 girls/nonbinary students in 5th-8th grade get to attend a keynote, engage in hands-on STEM workshops, meet STEM role

models, and more! Non-refundable (but waivable) registration fee: \$25. For more info, or to register, visit www.stemsantafe.org/programs.

Female Space Pioneers

Electrical engineer **Katya Echazarreta** became the first Mexican-born woman in space on 4 June 2022 onboard Blue Origin as a Space for Humanity Ambassador.

Samantha Cristoforetti, first Italian woman in space, took command of ISS Expedition 68 on 28 September 2022. She was recently joined on the ISS by the first Native American woman in space, **Nicole Mann**. See www.space.com.



Future Space Pioneers

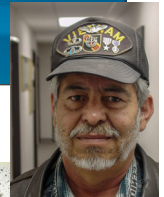
Teachers, imagine a Space Force Guardian discussing STEM careers in space with your students! **STEMtoSpace** is facilitating virtual connections between Guardians and K-12 classrooms between 1 and 21 December 2022. Interested? <https://sites.google.com/afk12stem.org/stemtospace/home>.

STEM TO SPACE



UNITED STATES SPACE FORCE

In Passing



Decorated veteran, long-time civilian and contractor for AFRL/RDM, and former AFRL NM STEM Academy Flight Enthusiast mentor **Rudy Martinez** passed away on 16 September 2022. Thanks for your service, friend!



Valery Polyakov, Soviet cosmonaut who set the record for the longest single stay in space, 437 days, in 1994-95, also recently passed.

Coming Next Issue...

- Mars is neighborly, New Teachers Trained report
- Rockets launched!
- STARBASE D3 Tech.

Watch for it!

