



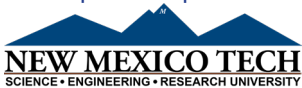
The Rocket Report

New Year, New Ways to STEM

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In partnership with:



Collaborator:



Reserving school buses for our activities will only be necessary if and when classes resume in our facility on base.

Welcome to 2021—a brand new year with brand new potential.

In this new world we've found ourselves living in lately, we've all had to learn some new ways to get things done.

At AFRL NM STEM Academy, for example, we've had to learn whole new ways to STEM.

We've beefed up our website to be more interactive and functional. We've learned Zoom and similar technologies to interact virtually with teachers and students at home or school. We assemble kits containing



materials for students to use to complete activities remotely while participating in one of our missions.

We've made new online-based activities such as Papa Cupcake's Binary Card Game, and restructured some of our programs to emphasize virtual activities that focus on coding.

Plus, our teachers and men-

tors make videos such as our Mars Talks series, for our website and/or YouTube channel.

One of the newest videos on our YouTube page is a [Cryo Demo Video](#). AFRL Research Physicist Dr. Brian Kasch uses liquid nitrogen to demonstrate things such as a cool new way to make a banana split...with a hammer.

Mission to Mars For Fifth Graders

Mars Hovering Observational Planetary Exploration System (HOPES) Mission 2020-2021

Three Things

What are the three most important things in Real Estate? Location, location, location.

Mission to Mars students have been busy submitting their colony locations to us, and they're using three things: Latitude Math, Longitude Math, and ASCII Codes, to determine it.

See our website (www.afrlnm.com/stem/mars-colony-location/).



Riddle Me This

The Mars Facts Knowledge Check Kahoot! games have started, and they're riddled with riddles. Mars named after a candy bar? Don't know, already ate it.

Students are also submitting their own Mars Fact riddles, some of which might end up in the final Kahoot game (afrlnm.com/stem/mars-facts/).



Radiating Charm

Dr. Ryan Hoffman, an AFRL scientist, radiated pure charm when he gave an Expert Talk on 12 January 2021. He discussed various types of energy, such as chemical, electrical, or nuclear, and how important it is for Mars astronauts to protect themselves from moving space energy, or radiation. Otherwise, it might hit them in the face like a big ol' soccer ball!



Life Support

Mission to Mars students sketch a design of one of eight life support systems in their Mission Journal.

They also build a model using materials found around the house. The model



does not have to actually function (www.afrlnm.com/stem/life-support-system/).

How will it operate? What will it contain? How would it work on Mars as opposed to Earth?



See the Mars Expert Talks section of our website (afrlnm.com/stem/expert-talks/), and catch some rays!

Next Expert Talk:
26 Jan.





I AM THANKFUL FOR..

A Atoms	N News
B Batteries	O Oxygen
C Chemistry	P Pebbles and Pumpkin
D Digital	Q Quizzes
E Electricity	R Rube Goldberg Machine
F Fun	S Spike
G Gas	T Technology
H H2O	U Units
I Isaac Newton	V Vehicles
J Johnny Appleseed	W Wires
K Kinetic Energy	X Excellent eXperience
L Lava Lamp	Y Yarn
M Molecules	Z Zoom Meetings

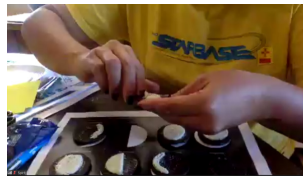
Oreo Twinkle Alphabet Rocket

In DoD STARBASE NM Day 5, students virtually explore activities revolving around the moon, rocket ships, and space flight.

Space Flight

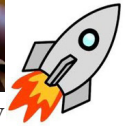
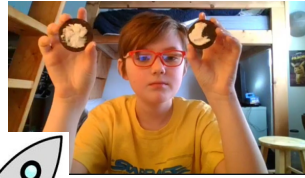
An old proverb that dates back to at least the mid 1500s claims that the moon is made of green cheese.

But that's just a myth. The moon can't really be made of green cheese. Everyone knows the moon is really a giant Oreo cookie!



Students test this theory by making their own Oreo cookie moons. So many things to consider: Is it waxing or waning? Crescent or gibbous? Each cookie represents a different phase of the moon. Astronomy was never quite so tasty.

But how are we going to get to



the moon to eat the cookie? Students explore Newton's Laws and fin and nose cone design when they build and test their own rockets.

Ms. Granstrom's Seven Bar Elementary School class sent us a cute alphabet STEM thank you card recently. But this will send your head to outer space: Did you know the Alphabet Song is the same song as *Twinkle Twinkle Little Star*?



TECH Mission

For Middle Schoolers
Technology and Engineering Challenges—Satellites Mission

LEctennas and SSPIDRs

Little Miss Muffet sat on a tuffet (what the heck is a tuffet?!) eating her curds and whey (sounds yummy. No Oreo cookies, huh? Must be a new moon).

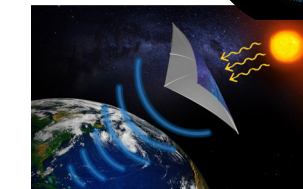
Along came a SSPIDR, and sat down beside her, and said, "Hey, pass me that LEctenna, would you? I wanna beam some power across the room."

One thing TECH Mission students get to build is a LEctenna. That's the Naval

Research Laboratory's name for a "light emitting diode (LED) rectifying antenna." It converts, or *rectifies*, microwave energy such as WiFi into direct current (DC) electricity, which then can power things like a light-emitting diode.

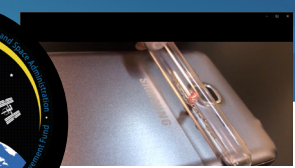
Remember: *Checktify* yourself before you *rectify* yourself.

First, the students wrap the LED around something called a Schottky diode and



stick it in a test tube. Then they bring it near a WiFi antenna like on their smart-phone...and the LED lights up! They even demonstrated this on the ISS recently.

AFRL's SSPIDR (Space Solar



Power Incremental Demonstrations and Research) project is working on a big space version, to collect solar energy in space and beam it to the planet below, 24 hours a day, no clouds in the way!

Still don't know what a *tuffet* is, though. Need to *rectify* that.



Robotics Challenge

For Middle Schoolers

Sensors Detecting STEM, Captain

Sensors sounds like the fancy, high-tech things Mr. Spock was always fussing over on board the bridge of the Starship *Enterprise* in *Star Trek*.

"Sensors inoperative, Captain. Sensors show no life signs aboard." "Unable to find the landing party on my sensors, Captain."

But in reality, sensors are quite commonplace. They're all around us, even *part* of us!

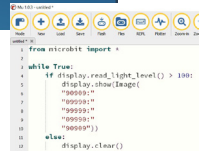
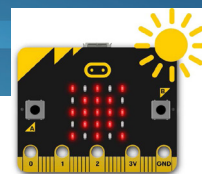
Anything that senses the presence or condition of something is a sensor.

Many everyday objects around us have sensors. Your television set has a sensor that can detect when you push a button on your remote control. Smoke detectors can detect when the air is getting smoky, and start beeping in case there's a fire. Tire pressure sensors in your car can tell when your tire is getting flat.



Animals have sensors. Cats, for example, have *whiskers* by their nose that can detect subtle vibrations in the air, in case food or danger is nearby.

People have lots of sensors. We have ears that can sense sound vibrations in the air, eyes that can sense certain electromagnetic spectrum waves in the visible light range, and fingertips that can sense heat and pressure.



Robotics Challenge students explore some of the micro:bit's sensors in Module 2. Using Python code, they can use micro:bit's *temperature sensor* to get a feel for how hot it is in the area and display it on the LED grid.

That little LED display grid? It's also a *light sensor*. Students use another Python program to determine how much light is hitting the LEDs.



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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

HOPES: Mars Hovering Observational Planetary Exploration System 2020-2021

MM: Mission to Mars

PRS: Phillips Research Site

S&Es: Scientists and Engineers

STEM: Science, Technology, Engineering, and Math

TECH: Technology and Engineering Challenges

USAF: United States Air Force

Remember, Teachers:

Get those EPA Modification forms in!



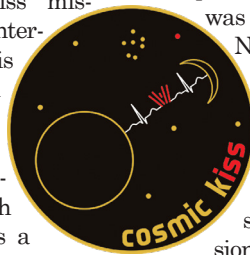
STEM Bytes

Cosmic Kiss, Nebra Disk, and Mission Patches

German European Science Agency (ESA) astronaut Matthias Maurer will be travelling to the International Space Station (ISS) this fall, on a mission they're calling "Cosmic Kiss" (something Captain Kirk did in pretty much every single episode of *Star Trek*).

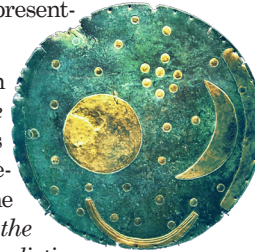
He'll be only the second ESA astronaut to fly to the ISS under NASA's commercial crew program.

The Cosmic Kiss mission patch is interesting. Earth is backlit, with only a thin line of atmosphere showing. Connecting the Earth and the Moon is a



human heartbeat graph, with a simplified red ISS "heart" in the middle. Nearby hovers the Pleiades star cluster and a small red dot representing Mars.

The inspiration for it is even more interesting. It's based on the Nebra Sky Disk, the oldest, or one of the oldest, known realistic depictions of the night sky. It was discovered in 1999 near Nebra, Germany.



See www.space.com.

Meanwhile, our own Mission to Mars students are designing some pretty cool mission patches of their own!



Upcoming

Upcoming Mars Events

Elon Musk's planned SpaceX mission to Mars had been planned for 2024, but this has been pushed back to 2026.

However, NASA's Mars Perseverance Rover and attached Ingenuity helicopter are scheduled to touch down on Mars on 18 February 2021.

Upcoming Earth Events and Deadlines

The deadline is 16 February 2021 for the virtual New Mexico Academy of Science (NMAS) **Science Research Paper Competition** for 6-12th grade students. See www.nmas.org.

Applications are being accepted for the free 2021 virtual **National Youth Science Camp (NYSC)**, for high school seniors who have demonstrated accom-

plishments in STEM. Deadline to apply: 28 February 2021. See www.nyscamp.org.

2021 STEM Award nominations are open now through 31 January 2021 www.afrlnew-mexico.com/stemys.

Nominations for rising 8th grade girls, by 7th grade math and science teachers, for the 2021 virtual Tech Trek, are being accepted through the end of January 2021 (<https://techtrek-nm.aauw.net/>).

Discover-E's virtual Engineer's Week is coming up 21-27 February, 2021. This year's theme: Imagining Tomorrow. Girl Day will be 25 February 2021 (www.discovere.org/our-programs/engineers-week).

Honda's STEM grant deadline: 1 February 2021 (www.honda.com/community/applying-for-a-grant).

Happy Birthday, Guardians



UNITED STATES
SPACE FORCE

Look out, Rocket Raccoon, we have some new Guardians of the Galaxy!

On 20 December 2020, the sixth and newest US Armed Forces member, Space Force, celebrated its first birthday!

Vice President Pence took the occasion to explain that while the Army has their Soldiers; Navy, Sailors; Air Force, Airmen; and the US Marines, Marines...

I am Groot-ful to announce... Space Force has *Guardians!*



Coming Next Issue...

- Habitats
- Robots
- Sugary Hearts and Chocolate

Watch for it!



JUNIOR SCIENCE & HUMANITIES SYMPOSIUM

March 12-13, 2021 - VIRTUAL

Application Deadline: February 17

APPLY NOW <https://cvent.me/rMeI9Z>



Contact Erin for more information: scifair@unm.edu or 505-277-4916

