

AFRL

NEW MEXICO STEM OUTREACH

Inspiring Future Scientists
and Engineers

AFRL NM STEM ACADEMY

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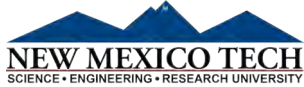
The Rocket Report



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In partnership with:



Collaborator:



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



CIMON SAYS...



...and Happy Holidays!

BBBS Spun Up

Over 3200 students attended the Big Brothers Big Sisters STEAM (an “artistic” spin on “STEM”) Discovery Festival at the Albuquerque Convention Center on 22 November 2019. It’s enough to make your head spin!

The theme for our booth was “Why Spin Matters,” and it mattered in all *sorts* of ways throughout the booth.

Students and visitors interacted with spinning Hoberman Spheres, tops, gyroscopes, spinning stools, disk-ramp races, and saw

how AFRL uses spin in space to stabilize satellites.

In a surprise turn of events, our booth won “Best Multi-Booth.”

There’s no other way to spin this: Thanks, BBBS, for making this event possible for students!



Teacher and Tech Grant



The CenturyLink Clarke M. Williams Foundation **Teachers and Technology Grant Program** is a competitive grant open to PreK-12 public and private school teachers.

The program helps teachers innovatively implement technology in their classrooms to increase student achievement. They will consider requests of up to \$5,000 from full-time classroom teachers employed by a public or private school in a CenturyLink residential service area.

Applications accepted until 12 January 2020. For more, see www.online.foundationsource.com/ws/index.jsp?site=CenturyLinkGrant.

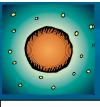
Hour:Code

Computer Science Education Week (www.csedweek.org), was 9-15 December 2019 this year, and everywhere you looked, there was a little bit of micro:bit coding action going on!

Our DoD STARBASE NM Day 4 students spent part of their day during the week coding little spherical “Sphero” robots using an iPad.

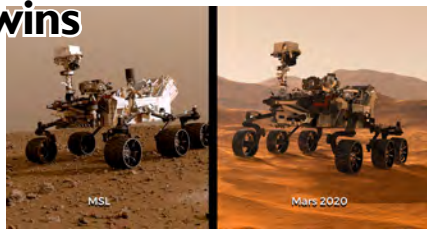
Hour of Code™ (www.hourofcode.com) activities we provided at the Tech Engagement Office on Wednesday, 11 December 2019 included students and visitors programming a micro:bit-driven *cyber:bot* from Parallax, and coding a Sphero to avoid micro:bit-powered strike hazards and bounce off the blue planet targets for a coding home:run!





Not Quite Twins

Fact: In 2003, twin rovers *Spirit* and *Opportunity* launched to Mars.

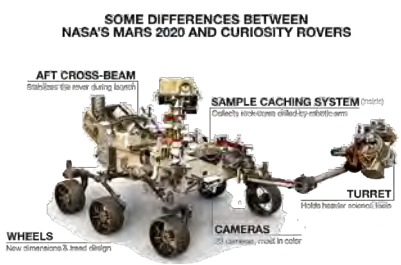


Fact: When the *Mars 2020* rover launches, as early as 17 July 2020, it will represent the latter half of of the *second* pair of twin Mars rovers ever launched.

Well, not *exactly* twins.

The *Mars 2020* rover looks pretty identical to the *Curiosity* Mars Science Laboratory rover driving around up there, but, fact is, there are a few key differences.

Here's the facts: Mars 2020 is about five inches longer, 278 pounds heavier, has six more



cameras plus two microphones, better wheel treads, more self-driving capability, and new tools like an oxygen generator and subsurface radar. For more Mars 2020 news, see www.space.com.

According to the “Mars Facts” chart in the manual, the atmosphere on Mars is 95% carbon dioxide, whereas on Earth it consists of 78% nitrogen and 21% oxygen.

Fact is, it's going to be rather hard to breathe over there, unless some kind of Air Supply life support system is taken along. For more Mars Facts, see pp. 53-56 in the manual.

Students incorporate four of these “Mars Facts” into their life support system model design.

The “Mars Facts Bingo” and “Mars Facts Card Game” in Chapter 6 of the manual can help your students get their facts straight. That fact is more than just a *Curiosity*.

Start SAGAs

A Mission to Mars Saga is a sung or spoken story, with optional choreography, that describes the students’ epic journey to Mars (pp. 33-34 in the manual).

Your students perform their saga for points on their Crew Mission Log upon arrival at their Colony Habitat site, and later for visitors to their colony, at Link-Up Day.



2020 Patch



Since Gemini 5, all NASA manned space missions have had a *mission patch* representing the crew and the mission. Even the *Mars 2020* mission has one!

Have students put some thought into the design of

their 2020 Link-Up Day mission patch (pp. 35-52).

Consider: Mission name (*Mars Exoplanet Transient Satellite (METS) Mission*); crew names; life support system; flags/colors symbolizing mission participants; patch shape and size.

Mark Your Mobile

It's not too early to Mark Your Mobile, specifically the calendar app in it, for the mandatory Mid-Year Meeting coming up on 11 February 2019.



Make your arrangements now!

Mars Notes

Mars habitat crews and Life Support System assignments have been sent out, including contact info for Telecommunications. Math problems and neighbor assignments will be sent out in January.

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

Technology Driving Coding

In DoD STARBASE Day 4, technology is driving coding.

Students take the driver's seat and use PTC Creo 3-D computer-aided design (CAD) software to design and create a virtual space station.

Students take a little bit of **littleBits™**, a little bit of energy, a little bit of STEM, and a little bit of creativity—and,



like magic, they turn into little inventors!

LittleBits™ are little color-coded, modular electronic components, that, when snapped together, create a circuit.

Students take the wheel of a tablet and drive spherical Sphero® robots around.



But coding isn't left out, right, Lefty? Even during Computer Science Engineering Week, in time for the Hour of Code™ (www.hourofcode.com), coding took center stage when the students made code movement programs for their Sphero® robots on their tablets, using block programming.

Level UP!



Congratulations to the AFRL NM STEM Academy DoD STARBASE NM crew!

It was recently announced they have earned STARBASE Level III status.

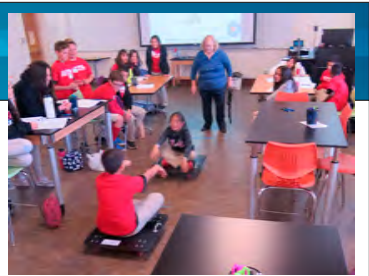


By the Tuesday of the week before the first class in the series, session, or semester, we will ask you for the name, driver's license number/state of issue, date of birth, and the FULL Social Security Number, of every adult coming through the base gate for that series of classes.



TECH Mission For Middle Schoolers

Technology and Engineering Challenges—Fall Rocketry and Spring Satellites Missions



RL Tributes

Ms. Alison Martin sent us pics of Sierra and Ainsley at ages 11 and 16. They did a TECH Rocket Launch in 2014, and won a raffle to keep the rocket, "Spirit."



They recently relaunched that rocket in 2019 with their Scouts BSA Troop, and re-modeled for a 2019 photo.

San Felipe Pueblo Elementary School made the cool Rocket Launch 2019 display at right.



Also, check out Washington MS's TECH RL 2019 website: <https://padlet.com/novicki/sblekh74rptu>, and Evan Britton's Rocket Launch Drone Footage video here: <https://youtu.be/UwHr4NXK64Q>.

D3 Drops By

Drop the mic! Middle school TECH Mission students are dropping by for TECH Mission Day 3.

First, the students analyze the data from the actual Rocket Launch and compare it to the original computer simulation version, and try to figure out why reality dropped the ball.

We drop some Newton's Laws on the students and show them how they apply to the rocket launches.

And, the students make payload protection suits for a bunch

of good eggs, to protect them while we politely drop them from the top of a high staircase, trying to *slow* their velocity.

Have you noticed? For some reason, whenever STEM is involved, the eggs are always the first ones out there, offering to take one for the team.



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

Green, Pageant, Whisker

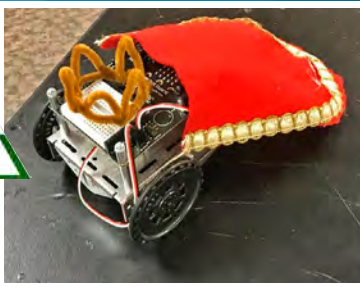
Of course, it's time to complete the **Green Course, Assignment 5**. It's due **10 January 2020**.

Create a video of your robot successfully navigating the green course. Save your video on your computer with the name of your team followed by "Green" (example "Bots Green") as the filename.



Robot Pageant pics (Assignment 2), are due **17 January 2020**.

Like this one, for example: The Cash Money team's "Yeast Biscuit IV" robot:



If your team qualifies to participate in the Expo, we will ask you to bring your pictures to exhibit at our facility.

Assignment 6, Whisker Sensors, is due **24 January 2020**.

Create a video of your robot successfully navigating around the room, avoiding obstacles using the whisker sensors.



STEM Challenge For High Schoolers

Payload Protection

Suggested Timeline: Nov/Dec
Not to get your guard up, but your team's egg is going to need some serious protection to get through the STEM Challenge in one piece!

Coaches, have your student teams protect their eggs by designing a **Payload Protection Device!**

Teams research different approaches to cushioning an egg payload, and select three of them to examine more closely. They write a description of the three approaches,

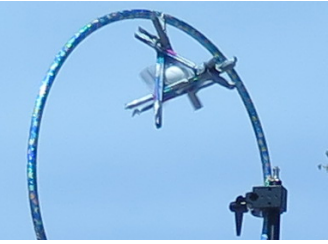


including their sources. What are their similarities and differences?

Does one seem better suited to the design problems your team is experiencing? Can any approaches be combined?

Then teams create a design plan, including a sketch or diagram. Why this design? How big is it? Will it work with the launching device?

Security guards are optional.



Alexander the Trebuchet



Duck Dynasty



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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

METS: Mars Exoplanet Transient Satellite (METS) Mission 2019-2020

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 to the Power of 2



CIMON-2

Last November, the Crew Interactive Mobile Companion (CIMON) became the first-ever autonomous free-floating robot on the International Space Station (ISS), and the first-ever "smart astronaut assistant."

The astronauts liked working with CIMON. So, recently, an upgrade was sent up called CIMON-2. It can analyze astronaut's voices to determine their mood, answer questions like an interstellar floating Alexa, and use its camera to photograph astronauts' experiments, even from another room. It may stay on the ISS for as long as the next three years, and long-term, CIMON may go to the moon, Mars, and beyond.

But if it ever says, "What do you think you're doing, Dave?" *Run.*



Simeon 2.0

1st Lt Simeon Hanks has been an excellent mentor for us at STARBASE 2.0 and other events. He recently sent us an awesome quote:

"STARBASE 2.0 and TARC (Team America Rocketry Challenge) are very special, in that they allow the public to see the military as members

of our society...gluing fins on to model rockets and inspiring the next generation of scientists, mathematicians, and engineers.

We get to lead and inspire students all over the socioeconomic map. The outreach these programs manage has an unbelievable impact on the students, parents, and teachers of local schools that would otherwise not have budgets to support many of these projects.



After working with this team for 3 years, I know I will be a life-long advocate of STEM outreach via similar programs."

Super Grover 2.0

Move over for Grover, Papa Cupcake!

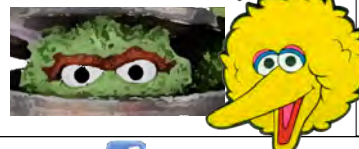


Last month, we ran a story about Oscar the Grouch from *Sesame Street* in our Robotics Challenge article.

A few weeks later, the *creator* of muppets Oscar the Grouch and the iconic Big Bird, Carroll Spinney, passed away. Last month was *also* the 50th anniversary of *Sesame Street*!

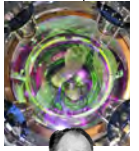
So now seemed like a good time to tell you that **Super Grover 2.0** is teaching young students STEM! Like many scientists and engineers, Super Grover 2.0 makes a lot of mistakes...but he never gives up until he succeeds!

Check out Sesame Workshop's **Little Discoverers** site (www.sesamestreet.org/tool-kits/stem) to get an early start on STEM activities!



Light Squeeze

The Laser Interferometer Gravitational Wave Observatory (LIGO) recently got an upgrade that allows it to reduce noise by *squeezing light*.



But what would Mr. Whipple think? See www.physicsworld.com.



Nom a STEM Y



If you know someone doing amazing things in science, technology, engineering, math, or science education, it's time to nominate them for an Excellence in STEM Award. Nominations for New Mexico's only state-wide STEM awards, also known as the STEMYS, are open through **January 31, 2020**.

The Air Force Research Lab Tech Engagement Office created the STEMYS to celebrate those individuals and groups that are making a difference in STEM activities and education in New Mexico.

Nominations must be submitted online at www.afrlnewmexico.com/stemys.



Coming Next Issue...

- Telecommunications
- Happy New Year
- Satellites, Sensors, and Expanded Horizons

Watch for it!

