



The Rocket Report

Well, We Webbed

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In partnership with:



Collaborator:



Remember, Teachers:

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



In *A Return to Love*, Marianne Williamson wrote:

"It is our light, not our darkness, that most frightens us. We ask ourselves, who am I to be brilliant, gorgeous, talented and fabulous?"

Actually, who are you *not* to be?"

As we begin a new year full of new hope and new possibilities, ask yourself:

- What would make you jump out of bed in the morning *psyched* to grab your coffee, or your soda, and start your day?
- What would wake you up in the middle of the night, so many ideas swirling around your head that you have to write them down?

Well, we think we have an answer for you: **STEM!**

Once you catch the STEM bug, it's very infectious. You can't *help* but get excited about all the new things there are still to explore, or discover, or invent!

And Marianne Williamson is *right*: Who are you *not* to be brilliant, gorgeous, talented, and fabulous?

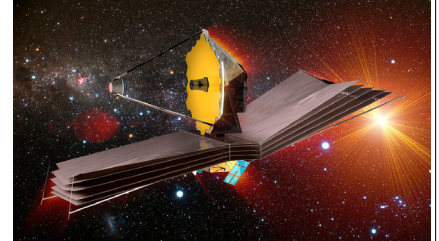
With STEM, you can be *all of those things*.

It doesn't matter who you are or what you look like, all that matters is that you like STEM, study STEM, and try to apply STEM to solve problems.

That easily takes care of the brilliant, talented, and fabulous parts, and the big ol' smile on your face when you realize how much *fun* STEM is takes care of the rest!

Like the folks at NASA. They're smiling pretty **BIG** right now. Why? Because on 25 December 2021, their next-generation replacement for the Hubble Space Telescope, called the James Webb Space Telescope (JWST), finally launched, and has now succeeded in completely unfolding itself to prepare for duty!

This has been a long time coming. The JWST began develop-



ment back in 1996, and was initially scheduled to launch in 2007. Construction issues, pandemics, and other delays kept pushing the launch date further and further back until some began to wonder if it would *ever* launch.

Congratulations, JWST! Now you're a brilliant, gorgeous, talented, and fabulous space telescope... *flying through space!*



This could be YOU

Mars Kahooting



The Mars Facts Challenge Kahoot! games have started, and they're riddled with riddles (<https://afrlnm.com/stem/2022-mars-viva-mission/>).

Challenge #1 is already up and available to play through Friday,

21 January 2022, and they'll rotate about every two weeks.



Mars teachers, when Kahoot! asks for your student's "Nickname," have them enter their first name and school initials. Example: If their name is George and the school is Hayward Elementary School, their Kahoot! Nickname would be "George HES."

Ready, set, *Kahoot!*

Bruja's New Title



Lynn "Bruja" Embick has conjured up a new title! Not to worry, she's still "Bruja," Spanish for "witch" (the good kind!). But her new *job title* is "STEM Outreach Specialist!"

She's moved over from the STARBASE classroom, and is already hard at work helping us conjure up some Robotics Challenge activities.



Mission to Mars

For Fifth Graders

Mars Vast Interferometer Variable Array (VIVA) Mission 2021-2022

Crew Registration Forms are due at the Mid-Year Meeting. Print legibly; we'll use them to generate student certificates.



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

Three Things

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



One of the first tasks Mission to Mars fifth grade student colonizers will want to undertake is figuring out *where* on Mars they will be setting up their colony.

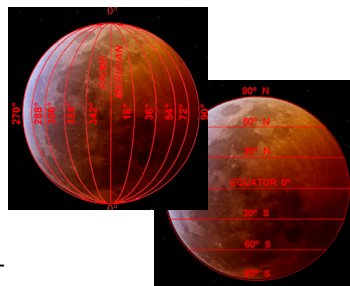
To accomplish this, students can go to the Mars VIVA Mis-

sion website (www.afrlnm.com/stem/mars-colony-location/), and click on the Mars Colony Location task on the Base Operations Control Panel to obtain three clues to their colony location.

The three clues involve solving a Latitude Math problem, a Longitude Math problem, and decoding a Latitude ASCII Code.

These answers can be written in their Student Jour-

nals. With those answers and the Mars topographical map, students can fill out the *Mars Colony Location Form*.



Kahoot Fractions

When Mission to Mars students complete Kahoot Mars Facts Challenges (see page 1), their Student Mission Journal asks them to calculate the "Correct Answer Percent."



This is another way of saying the *fraction* of the total number of questions in the game that were correct: The top number is the number of correctly answered questions, the bottom number is the total number of questions in the challenge.

Dividing those two numbers results in a decimal number. Remove the decimal and add a "percent" symbol, and that's the "Correct Answer Percent!"

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 (www.afrlnm.com/stem/life-support-system/). *Note:* The model does not have to actually *function*.

How will it operate? What will it contain?

How would it work on Mars as opposed to Earth?



The Floor is Lava

Mars...or Mustafar? The Mars *Perseverance* rover recently discovered the bedrock it was driving on was formed from volcanic activity...proving that yes, in fact, the floor *is* lava.



Which likely explains why the *Ingenuity* Mars helicopter spends so much time in the air.

Meanwhile, the Trace Gas Orbiter has discovered lots of water ice under the Valles Marineris floor. See www.space.com.

Mark Your Mobile

It's not too early for Mars teachers to Mark Your Mobile, specifically the calendar app in it, for the mandatory Mid-Year Meeting coming up on 24 February 2022.

Mission to Mars teachers, make your arrangements now!



DoD STARBASE NM

For Fifth Graders

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.

Asteroids Do Not Concern Me

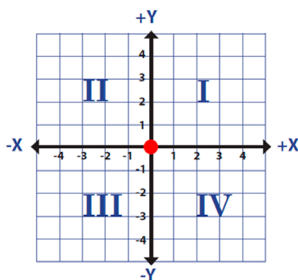
ZAP! The Asteroids

Fifth grade DoD STARBASE NM Day 5 *Space and Flight* students are tasked with a sensitive mission.

Four asteroids have been detected in space, threatening to collide with DoD STARBASE communications and GPS satellites.

Student teams need to program a special asteroid-destroying drone to travel to each asteroid and Zap! the asteroids before they can collide with the satellites.

The first thing the students need



to do is find the location of four satellites and four asteroids in a *Cartesian Plane*.

The Cartesian Plane is a numbered grid that mathematician, philosopher, and scientist Mr. René "I think, therefore I am" Descartes



came up with a few hundred years ago for determining just wherefore, therefore, he thought he *was*.

In doing so, he may have inadvertently invented the game *Battleship*. But I think, therefore I digress.

Anyway, student teams coordinate to record the location of the asteroids and satellites using *coord-*

inate pairs, and then program a ball-shaped *Sphero* robot drone to navigate to the asteroids while avoiding AFRL satellites.



Flight Simulation

The students also fly through the study of flight.

Air Force pilots and flight enthusiasts discuss their careers with the students, and then students try to fly Flight Simulators, using decidedly *non-Cartesian* planes!





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.

Science vs. Engineering

Science, Technology, Engineering, Math: STEM. We say it all the time.

It almost sounds a bit redundant, doesn't it? Science and Engineering go together so well, it sometimes seems like they're pretty much the same thing...

Maybe we should just call it "TEM."

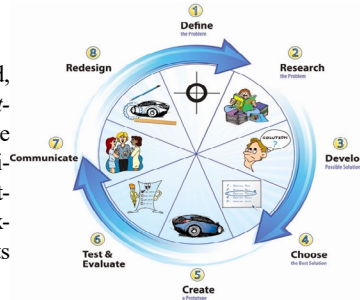
But here's the thing: Engineering is *not* science. Engineers generally don't "do" science. Science is about discovering the *natural*. Engineering is about creating the *artificial*.

STEMJobs (www.stemjobs.com) has this to say about it:

1. "Scientists *observe* the world, while engineers focus on *creating*. While both fields do involve observation and analysis, engineering mainly deals with creating and working on already existing creations, while scientists work with things in nature.

2. Engineering is a much more specific field. Even though engineering deals with a variety of issues and topics, it's narrowed down to the study of how things work. Science has a much broader range of study.

3. Science creates *questions*, while engineering creates *solutions*.



So the two truly do complement each other."

Take TECH Mission (Fall semester) Day 3, for example. Eggs are about as *natural* an object as you can get, but TECH Mission students use the *Engineering Design Process* to make payload protection

suits to cushion them and slow their *velocity* while being dropped from the top of a high staircase.

Next month, a whole new set of challenges begins, for a whole new group of TECH Mission classes: The Spring Satellite Semester!



Welcome To the Zoo

Robotics Challenge Module 1 is closing 31 January 2022. If anyone has a *beef* with that, well... let's *taco* 'bout it.

Robotics Challenge Module 1, *Intro to Programming*, gives students the skills to program, or *code*, in the computer language *Python*.

Reading through the challenges in Module One, it starts to sound a little like *My Day at the Zoo*. Students are programming in Python, which is a type of *snake*, but when *drawing* things in Python,

you don't draw with a snake. You draw with a *turtle*.

See, a *module* is a collection, or block, of code that can be used in your program. Modules make coding faster and easier because most of the code is already written.

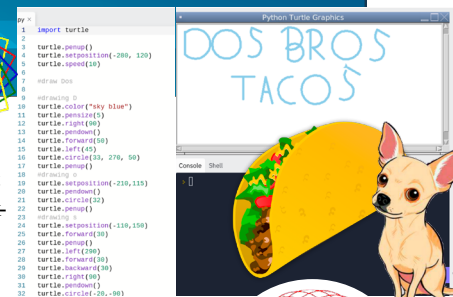
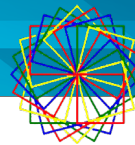
The *turtle module* in Python is basically the computer equivalent of a turtle holding a pen in his little turtle foot while standing on a giant sheet of paper lying on the floor.

The turtle can be coded to draw vari-

ous shapes, letters, and designs on the paper by having him face different directions, move forwards or backwards, raise and lower the pen, and change pen colors and widths.

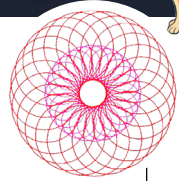
You can even change the *speed* of the turtle, but whoever heard of a *fast turtle*...besides the Teenage Mutant Ninja ones?!

Challenge 7, Module 1, has students writing code to make the turtle draw their Team Name, like the "Dos Bros Tacos" team did. *Turtles on a half (taco) shell... Turtle Power! Yo quiero Taco Bell.*



Challenge 8 adds some "For Loops" code to make the turtle draw cool Spirograph shapes.

Interested in participating as a coach or an Expo judge? Contact Lynn@afnlmexico.com for more info.



Device Invest-egg-ation

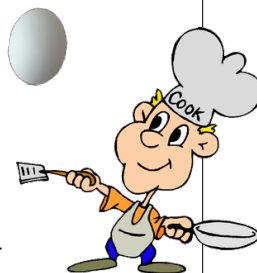
Suggested Timeline: Jan/Feb

Save your eggs' bacon! Get them out of the frying pan and into the flying plan by *building* and *testing* your **Payload Protection Device**.

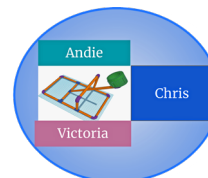
To test *height*, have your teams place a raw hen egg into the device and drop it from the max payload height per Assignment 2.

Toss it 30 feet to test *distance*.

Did the egg survive?
Did the device roll a lot before coming to rest?
Does the payload protection device design need more work, or does it pan out? Get it?? Pan out?? I crack me up.



Los Logos!



CAVAPULT

Team 08--
CAVAPULT



Team 09--
C.O.C Builders



Team 07--AUX
Catapult Company

MANGONEL 2.0



Team 10--
Mangonel 2.0

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YouTube Channel:

<https://www.youtube.com/channel/UC-QuOSd1XTkYuXPONZwIAHQ/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

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

VIVA: Mars Vast Interferometer Variable Array Mission 2021-2022

Remember, Teachers:

Get those EPA Modification forms in!

STEM Bytes

Tech Trekkin'



STEM, the final frontier. Winner of the 2021 NMOST STEM Equity and Inclusion Award, and the 2019 STEMYS Non-Profit of the Year Award!

The American Association of University Women of New Mexico (AAUW-NM)'s annual **Tech Trek** is "boldly going where no man has gone before..."

...because it's a week-long residential summer camp for girls passionate about STEM!

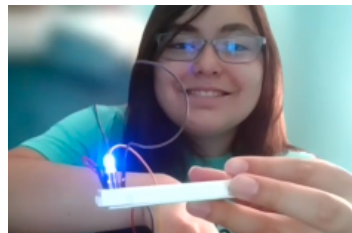
- Local middle school science and math teachers identify girls to attend Tech Trek.
- Girls apply and are selected to attend the camp.
- Attendees reside for the week on the NM Tech campus.
- During the week of camp, girls attend a daily math or science core class.
- Girls perform hands-on activities throughout the day.
- A one-day field trip enhances STEM learning.
- Girls interact daily with women STEM role models.

The 9th annual week-long Tech Trek summer camp will return to an in-person residential format **19-25 June 2022** at New Mexico Tech in Socorro, NM...

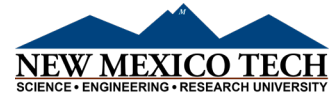
...unless ongoing Covid-19 pandemic conditions make changing to a different format, such as a hybrid format, prudent.

- Girls hear from women STEM professionals at a Professional Women's Night.

Precautions will be taken to make the residential camp as safe as possible. All Tech Trek NM staff and campers will be required to be fully vaccinated (including boosters) for Covid-19, following all recommended CDC and NM-DOH guidance including masking, social distancing group size, and testing.



In the event changes in the situation in New Mexico make holding a residential camp inadvisable, they will change to a *hybrid format* with a mix of small in-person day core classes around the state, followed by virtual programming for workshops and virtual field trips.



Former campers say things like:

"If you were ever in an all-boys [STEM] group at school and weren't allowed to do anything, this is the place to go."

"The classes are much more in-depth than the classes at school so I can get a much better idea of the STEM subjects."

"This camp has got me interested in many different types of science that I hadn't even known existed before I came here."

Nominations for 2022 by 7th grade math or science teachers are due **28 January 2022**.

Nominated girls are invited to submit a Tech Trek NM **application**. **Deadline is 28 February 2022**.

For more information, see www.techtrek-nm.aauw.net or email techtreknm@gmail.com.

Weeks Next Month

The National Museum of Nuclear Science & History's Discover STEAM Week, for grades 1-8, is **14-18 February 2022**; applications deadline is **31 January 2022**.

Discover-e Engineer's Week, *Reimagining the Possible*, is 20-26 February 2022.

See www.nuclearmuseum.org and www.discovere.org/our-programs/engineers-week.

Coming Next Issue...

- Uniforms on Mars
- Satellite TECH
- Sugary hearts and chocolate...lots of chocolate

Watch for it!



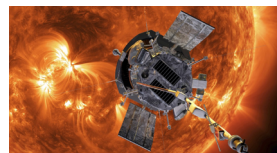
Webb Window



When the James Webb Space Telescope (JWST) looks at distant objects, it's a window back in *time*, too. Light from those objects may have taken *millions* or *billions* of years to reach JWST's mirrors, so it sees them as they were *millions* or *billions* of years ago... almost back to the "Big Bang!"

Everything your *eyes* see is *also* in the past...but more like *milliseconds* ago!

NASA Touches the Sun



For the world is hollow, and I have touched the sun. Data from NASA's *Parker Solar Probe* recently confirmed that last April, the probe actually flew through the corona of the sun at least *three* times.

It was about 8 million miles (13 million kilometers) above the center of the sun at the time.

See www.space.com.