



The Rocket Report

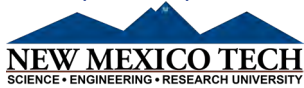
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Due to precautionary measures related to the coronavirus, we are developing and delivering virtual STEM activities that will be available to you through our website and social media pages (Facebook, Instagram, and Twitter).

As the situation evolves, we will provide updates.

In partnership with:



Collaborator:



Don't need school buses during the coronavirus lockdown, huh?!

STOP the SPREAD



STAY HOME and STUDY STEM!



Welcome to Virtual Reality

The term “Virtual Reality” is very broad. In its most basic sense, it refers to something that provides an illusion of, but is not in fact, reality.



When the phrase “virtual reality” comes up, many people typically think of someone wearing a *virtual reality headset*, usually resembling large black goggles, and waving their arms around in the air as they try to interact with the environment they see inside the goggles.

Most often, it is used in the context of creating a *simulated environment* using *computer technology*—for *entertainment*, as in video games, or *education*, such as classroom instruction and medical or military training.

On Kirtland AFB, for example, pilots learning how to fly the V-22 *Osprey* aircraft train on a V-22 *flight simulator*, which could be described as a form of virtual reality.

In each of these cases, however, the perceiver is able to easily distinguish between objective reality and the simulated one.

Simulated Reality, by contrast,

is more like the plot of the movie *The Truman Show*—the hypothesis that reality could be theoretically simulated so well that people could spend their entire lives inside it and never realize it was a simulation.

Augmented Reality is a type of virtual reality in which objects in the real world are enhanced with computer-generated virtual ones. We feature augmented reality demonstrations at some of our events from time to time.

Virtual STEM Reality

For our purposes, however, *virtual reality* means something else!

As we adjust to the new reality of *school closures* and *social distancing* during the coronavirus pandemic, we've made a few **changes to our program**.

We've placed our traditional science, technology, engineering, and math (STEM) activities, like DoD STARBASE NM and STARBASE 2.0;

TECH Mission; Robotics Challenge; and STEM Challenge, on *hold* for the remainder of the school year.

Instead, we are transitioning to a more *virtual STEM* reality, by developing activities that don't require students to gather *en masse* in their school classrooms or at our facility on Kirtland AFB.

Instead, students can stay at home and participate in our STEM program *virtually*, in an *on-line* environment.

We've already developed a number of STEM activities to explore! You can find them on our website, www.afrlnm.com/STEM.

So far, we've delivered a **Virtual Mission to Mars** event for 4th-6th graders, and a wide variety of **STEM 101** content for students in grades 3-8. We're also developing a “**Slice of Py**” section on our website that will provide computer programming activities for older students.

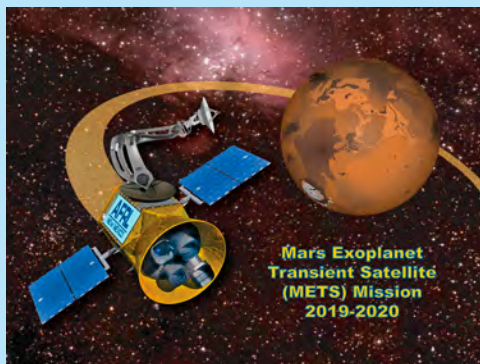
Visit our website for details. Also, be sure to check us out virtually on **Facebook**, **Instagram**, and **Twitter!**



VIRTUAL Mission to Mars

For Fourth-Sixth Graders

Mars Exoplanet Transient Satellite (METS) Mission 2019-2020



Due to precautionary measures related to the coronavirus, the 2020 Mission to Mars was restructured into a **Virtual Mission to Mars**, and a **Virtual Link-Up Day**, which was held, successfully, **15-24 April 2020**.

Around the World in Eight Days

Well, there we were, all set to go to Mars. Our fifth grade New Mexico teachers had attended their Mid-Year Meeting, gotten their plastic, and were preparing to bring their students and join us at the Albuquerque Convention Center to engage in an end-of-year Link-Up Day event.

Students would have circulated through holding stations and built colonies of habitats, all linked together, using their plastic, to wrap up this year's Mars Exoplanet Transient Satellite (METS) Mission.

But then, the Great 2020 coronavirus Lockdown happened. Schools closed. Events were cancelled. Everyone sheltered in place at home.

Well, that didn't stop *us* from going to Mars! We just took it VIRTUAL!

We revamped the METS Mission as an eight-day online virtual event, and opened it up around the world to fourth through sixth graders.

Students from over 24 cities around the country, representing over 11 states, plus overseas from places like England, went to our website, www.afrlnm.com/STEM, and registered at the 2020 METS Mission page.

Heck—it was almost more international than the International Space Station!



Tasks, Days 1-8

From 15-24 April 2020, Mission to Mars students engaged in various tasks, and investigated various research questions, as they prepared for their virtual trip to Mars.

Day 1 Task



Houston, we have a problem! One of the supply landers that arrived before our colonists has landed in the wrong spot on Mars! It appears that the supply lander is near Jezero Crater. We have been watching that area because NASA has selected it as the landing site for the Mars 2020 rover mission.

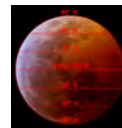
Jezero Crater is thought to have once been a lake that was as deep as 250 meters (830 feet). Scientists would like to examine the layers of sediment in the crater and the river deltas. Our supplies landed in a nearby basin that may once have been part of a vast ocean.

Find the *longitude* of the supply lander using the clues provided.



Day 2 Task

Find the *latitude* of the supply lander using the clues provided.



Day 3 Task

Decode an ASCII "word" to determine if the lander's north or south of the Martian equator.

Day 4 Task

Research Mars Facts and design (sketch, or build a model of) a life support system for your Mars colony.

Day 5 Task

Design a mission patch that depicts the special properties of your crew.



Day 6 Task

Create a four-choice answer Mars Fact Riddle from one of your Mars Facts, which may be used in a Kahoot! game on Link-Up Day.

Day 7 Task

Design (sketch, or build a model of) a Martian habitat.

Day 8 Task

Plan a Lunch on Mars using provided nutrition, weight, and space guidelines.

Other Mars Missions' Status

There were five *real* missions to Mars initially scheduled for launch during the prime July-August 2020 launch window. As of presstime, here's their current post-lockdown status:

Mars 2020 Perseverance

NASA's Mars 2020 Rover mission is still a **GO**, aiming for their July 2020 launch. Thanks to a seventh grader's submission, the rover has been christened *Perseverance*, which sounds about right in hindsight.

The mission also features a Mars Helicopter, which was successfully attached to the rover on 6 April 2020 for launch.



ExoMars

The joint ESA-Roscosmos ExoMars mission has been *delayed* to 2022.

China's Mars Mission

China's planned July rover-orbiter launch is still a **GO**.

UAE's Hope Mission

The United Arab Emirates still hopes its orbiter is a **GO**.

Japan's TEREX-I

Japan's piggyback orbiter-lander is *delayed* until 2022.

Virtual Link-Up Day

The Mars METS Mission 2020 Virtual Link-Up Day Event was held online on Friday, 24 April 2020 from 11:00 am to 12:30 pm MDT.

Congratulations to all partici-

pants; the mission was a **SUCCESS!**



See next month's newsletter for a detailed report.

STEM 101 is Here!

Can't go to school
That's the new rule
Don't wander and roam
Just stay at home
Help stop the spread
That's what they said
But STEM is cool
That's like a rule
Well, have no fear
STEM 101 is here!

Back in December 2019, we rolled out a completely revised and upgraded website at www.afrlnm.com/STEM.

Then, along came the coronavirus pandemic, and everything, including the schools, our events, and even the Air Force base our facility is located on, went into "lockdown mode."

Did that slow us down? No way!

We just started switching our activities over to virtual ones.

Using our new website as a platform, we've launched a whole new series of virtual STEM activities students can do from home, including our new **STEM 101** page! Check out the videos on our AFRLNM STEM Academy **YouTube channel**.

Explore STEM concepts with us in a combination of online instruction/resources and on-site activities. All ages welcome, but activities are best suited for 3rd through 8th graders.

Featuring our great STEM teaching pros *Blossom*, *Bruja*, *Spike*, and *Pebbles*, our first

Due to precautionary measures related to the coronavirus, including school closures, the scheduled 2020 DoD STARBASE NM, STARBASE 2.0, TECH, Robotics Challenge, and STEM Challenge Mission classes and events have been cancelled for the remainder of the school year.

Instead, in the interim we're transitioning to developing and delivering new virtual activities for students, including **STEM 101** and **A Slice of Py**.

Featuring:



two STEM 101 sections are **Engineering 101** and **Physics 101**, and **Chemistry 101** is next! Each section contains:

- **Blossom's Brainiac Board:** Daily STEM challenges and adventures.

- **Bruja's Magical Storytime:** Scientific STEM storytelling highlighting STEM concepts, experts, and advancements.
- **Spike's Science Spot:** Develops the natural scientist by making real-world connections to STEM.
- **Pebbles' Pantry Project:** Use common materials to design and execute STEM experiments!

Share the projects you create on social media, and tag us!

#DoDSTARBASENM,
#AFRLNMSTEM101

Engineering 101

Head on over to the **Engineering 101** section of our STEM 101 page and see what's there!

Blossom explores activities and adventures in engineering on her Brainiac Board.

Activities include: Designing a zip line, making an aluminum foil boat, and creating a tornado tube. Thanks, Blossom!

Bruja kicks off her Magical Storytime by introducing us to STEM innovator



Hedy Lamarr and engineering. Why? *Wifi!*

Spike, in her Science Spot, introduces us to the art of making observations, and shares how to safely reverse-engineer cool objects around your house.

Pebbles encourages us to experiment with simple machines as she shows us how to make and experiment with a marshmallow catapult.

STEM Challenge students, miss flinging food around with catapults? This activity is for you!

Physics 101



It seems Sir Issac Newton has decided to join us for the Physics 101 section of STEM 101.

Blossom explores activities and adventures in physics, such as Newton's Cradle, and Making a Rainbow!

Bruja introduces us to Dr. Wanda Diaz-Merced and Newton's Laws of Motion.

Spike observes the role of friction and forces in our everyday lives.



Pebbles encourages us to experiment with Newton's Laws of Motion using a rocket powered by baking soda and vinegar.



A Slice of Py

For Older Students

The Question is Mu

Python is a computer programming language designed to be powerful, yet easy to read and fun to use.

Which seems odd, since Python snakes are powerful, but hard to read and definitely *not* much fun to use. Then you realize it's actually named after the famous British comedy sketch group

Monty Python. Those guys are *much* more fun than snakes.

Python is used on platforms we've worked with before in our Robotics Challenge mission and other activities, like cyber:bots and Raspberry Pi computers.

Joey from *Friends* thought the question was *moo*, like a cow's opinion. It doesn't matter. The question of editors for Python

is not a "moo point," though; it *does* matter. *Mu* is an excellent choice—a free and widely-used editor great for new Python programmers.

Which brings us to our great news; have you heard? Our good friend Larry Heard is putting together a page for our www.afrlnm.com/STEM website called "A Slice of Py," for



engaging students in virtual Python programming activities!

He's already got some videos up on our AFRLNM STEM Academy YouTube channel, introducing viewers to Python and Mu and showing them how to download them and program something called *turtle graphics*.

So *Mu* on over and check it out!



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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 Bytes

Scholarship Open

The New Mexico Out-of-School Time Network (NMOST) (www.nmost.org) is a non-profit collaboration of public and private organizations and community members seeking to improve access to, and quality of, learning programs (before and after school, summer learning, and youth development).

Women remain underrepresented in the STEM professions and there is a need to close the gender gap and inspire the next generation of

female innovators and leaders.

Thus, NMOST has created the **Advancing Young Women in STEM Scholarship** to help address the gender gap in the STEM disciplines and STEM-related fields.

Applications are open NOW at www.nmost.org/young-women-stem through 17 May, 2020.

This year, NMOST will

be awarding scholarships between **\$500** and **\$1000** in value.



Applicants for the scholarship must be:

- A high school junior/senior applying for college in STEM OR an undergraduate in STEM
- A resident of New Mexico OR currently enrolled in a New Mexico college/university
- A young woman (25 or younger) pursuing a STEM education/career
- Have a minimum 2.5 cumulative GPA (based on a 4.0 scale)

Webinars Still On?

Looking for something constructive to do in STEM while we're all in virtual mode?

Speaking of NMOST, if you look on the right hand column of their website (www.nmost.org), it lists a series of STEM-related webinars coming up soon that appear to still be on, and might be the perfect thing for beating coronavirus lockdown blues:



For example:

Making STEM Meaningful for Girls - Wednesday, 6 May 2020, Noon MDT.

"Learn more about the research and practices that can increase girls' interest in STEM. In this webinar, we will share bright spots, highlighting programs that put these practices into action."

Girls STEAM Ahead with NASA Free Resources - Wednesday, 20 May 2020, 10am MDT.



"Provides a brief overview of the program and resources, including a range of computer and paper-based activities, along with exhibits and poster series."

TARC Update

As we reported last month...

The American Rocketry Challenge (TARC) 2020 Qualification Flights deadline and National Finals are postponed until 2021.

However, Marketing, Presentation, and Engineering Notebook awards are available.

They also hope to provide other activities to participate in over the summer.

The 2020 contest is simply being postponed until next year. The rules and requirements will remain the same.

Teams can use this year's rockets and qualification flights if they choose. If you would like to withdraw your flights, please email them. 2020 Seniors will not be allowed to compete again in

NASA DIY Mars

NASA has do-it-yourself stay-at-home Mars activities for junior student astronauts sheltering at home. See www.jpl.nasa.gov/edu/learn/tag/search/Mars. For example:

Make a Paper Mars 'Copter

Build a paper helicopter, then see if you can improve the design like NASA en-



gineers did when making the first helicopter for Mars.

Code a Mars Helicopter Video Game

Create a video game that lets players explore the Red Planet with a helicopter like the one going to Mars with NASA's Perseverance rover!

Make an Astronaut Lander

Design and build a lander that will protect two "astronauts" when they touch down.

2021, however.

See the TARC website www.rocketcontest.org/faq for more information about the 2020 Postponement.



Coming Next Issue...

- It's virtually summer!
- Summertime STEM

Watch for it!

