



New Year, New Nuclear Energy STEM Activities

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NE STEM Goals and Objectives

GOAL: The Office of Nuclear Energy works to engage youth and communities in nuclear energy education. The focus is on improving access to STEM education and workforce development opportunities, as well as increasing site-specific engagement. NE also collaborates with all three DOE Tribal Working Groups to increase STEM opportunities for youth and the workforce in Indian Country.

OBJECTIVES:

- Internships and Work-based training
- Fellowships/scholarships
- Course-based training
- Curriculum development
- Outreach and communication



[@GovNuclear](https://twitter.com/GovNuclear)

Navigating Nuclear STEM Resources

High School Resources:

- Digital Lesson Plans
- STEM Project Starters
- [Virtual Field Trip of Idaho National Laboratory](#)

Elementary School Resources

Middle School Resources

DOE has partnered with American Nuclear Society (ANS) and Discovery Education (DE) to support High School Resources (2019-2020) and Elementary School Resources (2020-2021)



Virtual Field Trip of Idaho National Laboratory



<https://www.navigatingnuclear.com/nuclear-reimagined-vft/>

Educator Guide Activities

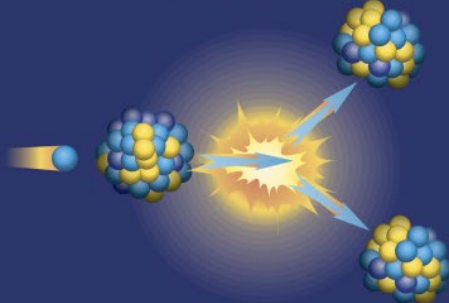
Fission

Chain Reaction

Fission vs. Fusion

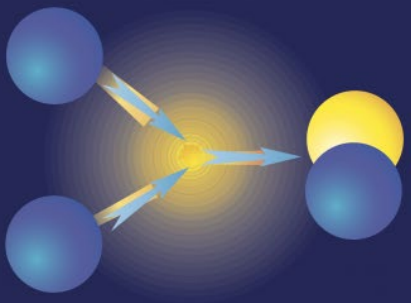
Physical processes that produce energy from atoms

FISSION

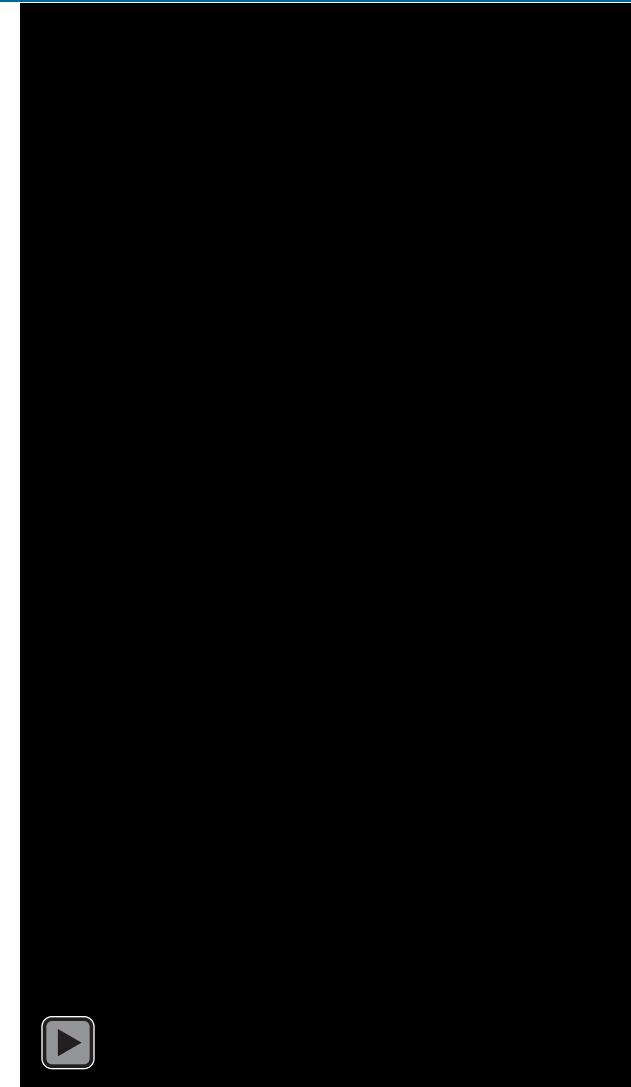


Splits a larger atom into 2 or more smaller ones.

FUSION



Joins 2 or more lighter atoms into a larger one.



Sarah Harman | U.S. Department of Energy

Global Collaborative STEM Opportunities



Making Mosquitoes SIT!

How can radiation solve problems and benefit humans?

In this lesson, students will be introduced to how radiation, such as gamma radiation, can be used to help solve problems by examining the quest to eradicate Aedes mosquitoes using the Sterile Insect Technique: (SIT).

 [Download STEM Project Starter](#)



Project Starters

Topic Making Mosquitoes SIT!

OBJECTIVES

Students will:

- Investigate types of radiation and understand how radiation can be used to solve problems and benefit humans.
- Gather evidence such as facts and statistics concerning deadly global diseases that use mosquitoes as vectors.
- Create a health campaign to inform the public of the use of mosquito sterilization as a sustainable technique to help combat the deadly diseases that they spread.

Overview

In this lesson, students will participate in an interactive survey to determine what their misconceptions may be about the risks and sources of radiation they are exposed to in their daily lives. They will next be introduced to how radiation, such as gamma radiation, can be used to help solve problems by examining the quest to eradicate Aedes mosquitoes, which are vectors for deadly diseases around the world. They will participate in a jigsaw, where students share information with each other about the mosquito's unique role in the transmission of pathogens such as dengue, malaria, and the Zika virus. Students will review various ways that humans have tried to control and eliminate mosquitoes that carry these diseases, and why there is a current need for alternative methods. Next, students will be introduced to the Sterile Insect Technique: (SIT). In SIT, male insects are sterilized in a laboratory through the use of gamma radiation to disrupt DNA, and are then released to mate. Mating is unsuccessful, which results in a sustainable decrease in insect pest populations over time in the areas where SIT has been used. Students will form groups and be asked to create a campaign to help garner funding and support for the use of SIT to combat mosquitoes and the deadly diseases they spread in an assigned country. They will introduce the specific problem in their country that is related to disease transmission by mosquitoes using research and statistics. They will also create an interactive 3-D model, animation, or video that explains how SIT uses gamma radiation for sterilization and describes the advantages of SIT over other control methods.

Grade Band

9-12

Nuclear Technique Helps Fight Mosquito-borne Illnesses



14 November 2019

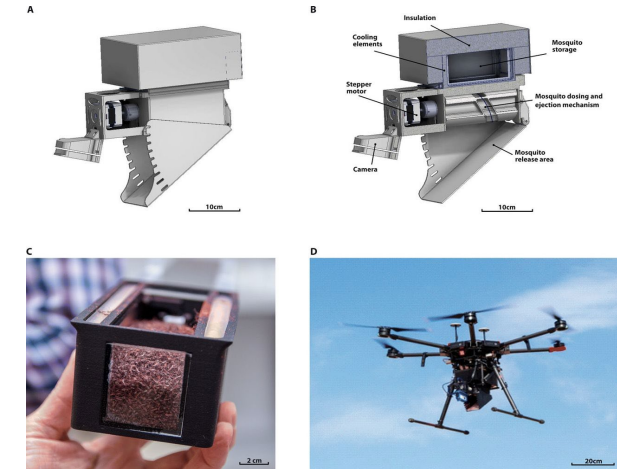


How you can use IAEA Videos →

Related Resources

- Insect pest control
- Sterile insect technique
- Exploring Genetic, Molecular, Mechanical and Behavioural Methods of Sex Separation in Mosquitoes
- Preventing Procreation: The IAEA's Research for Mosquito Control
- World-Wide Directory of SIT Facilities (DIR-SIT)

Future Iterations



<https://robotics.sciencemag.org/content/robotics/5/4/3/eaba6251.full.pdf>



Elementary Education Resources



[Home](#) [Classroom Resources](#) [Explore Careers](#) [Virtual Field Trip](#) [About](#)

NAVIGATING™ NUCLEAR Energizing Our World



Elementary School Resources

Guide your elementary school students through the world of nuclear energy with digital lesson plans, project starters, career resources, and more to power up the learning in your classroom!

Spark a reaction in your classroom with nuclear science! Start small by exploring an atom as the foundation for nuclear energy. Then, go big and learn how a star releases energy in the form of a nuclear explosion! Navigating Nuclear provides educators with standards-aligned resources to connect students to the many fact-based applications of nuclear energy. Students will use nuclear science principles to explore medicine, geology, energy, astronomy, and more!

Elementary Lessons

Lesson Plans



Amazing Atoms

Educator Lesson Plan | 45 minutes

Students to the concept of an atom. After watching a short video to help grasp just how small an atom is, the class will simulate an atom's structure as they take on the role of neutrons, protons, and electrons. They will be led to understand that there are different kinds of atoms, and that these different atoms contribute to everything around us.

 [Download Digital Lesson](#)



Exploring Energy

Educator Lesson Plan | 45 minutes

Students will be challenged to investigate different energy sources as they seek to find an electricity solution for a remote location. The class will first be introduced to fossil fuels, wind power, and nuclear power through images, a video, and a simulation.

 [Download Digital Lesson](#)



Smartphone Microscope Demonstration



[Video of Inventor Rebecca Erikson](#)
[Download Free Open Source 3D files for Microscope](#)

Nuclear Energy and 3D Printing

The Department of Energy (DOE) Oak Ridge National Laboratory (ORNL) successfully 3D printed a salt pump impeller for Kairos Power's new advanced reactor prototype. Additive manufacturing, also known as 3D printing, allows developers to make complex, three dimensional shapes from a computer design file. Traditional manufacturing methods would have required Kairos to mold, cast, finish, and machine the impeller before testing it. By incorporating 3D printing techniques with real-time data characterization, Kairos was able to cut months off of the design process and save thousands of dollars. Follow this [link](#) to read more about the 3D printed key components.



Kairos Power

3D Printing and Nuclear Fuel

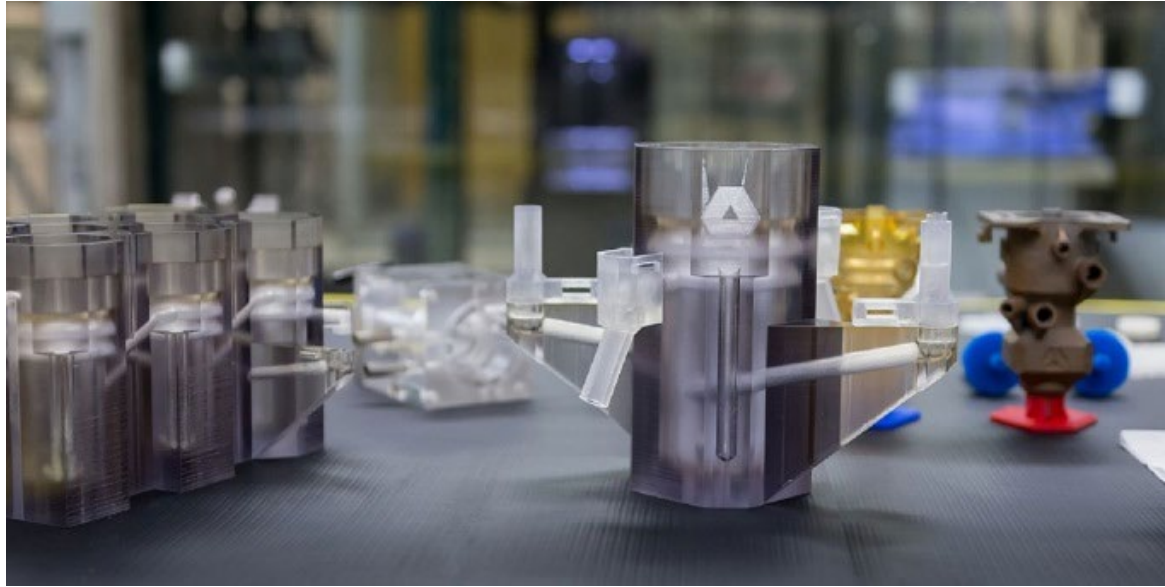


Photo courtesy Argonne National Laboratory

3D printing and nuclear fuel.

Another DOE National Laboratory, Argonne National Laboratory, is utilizing the flexibility of 3D printing, or additive manufacturing, as a pathway to recycle up to 97% of used fuel produced by nuclear reactors. This new approach could drastically reduce the amount of used fuel stored and the time it remains hazardous. Follow this [link](#) to learn more about

Culturally Responsive STEM Work in Alaska

Whale Bone (Village of Utqiagvik) using Smartphone Microscope (100X)



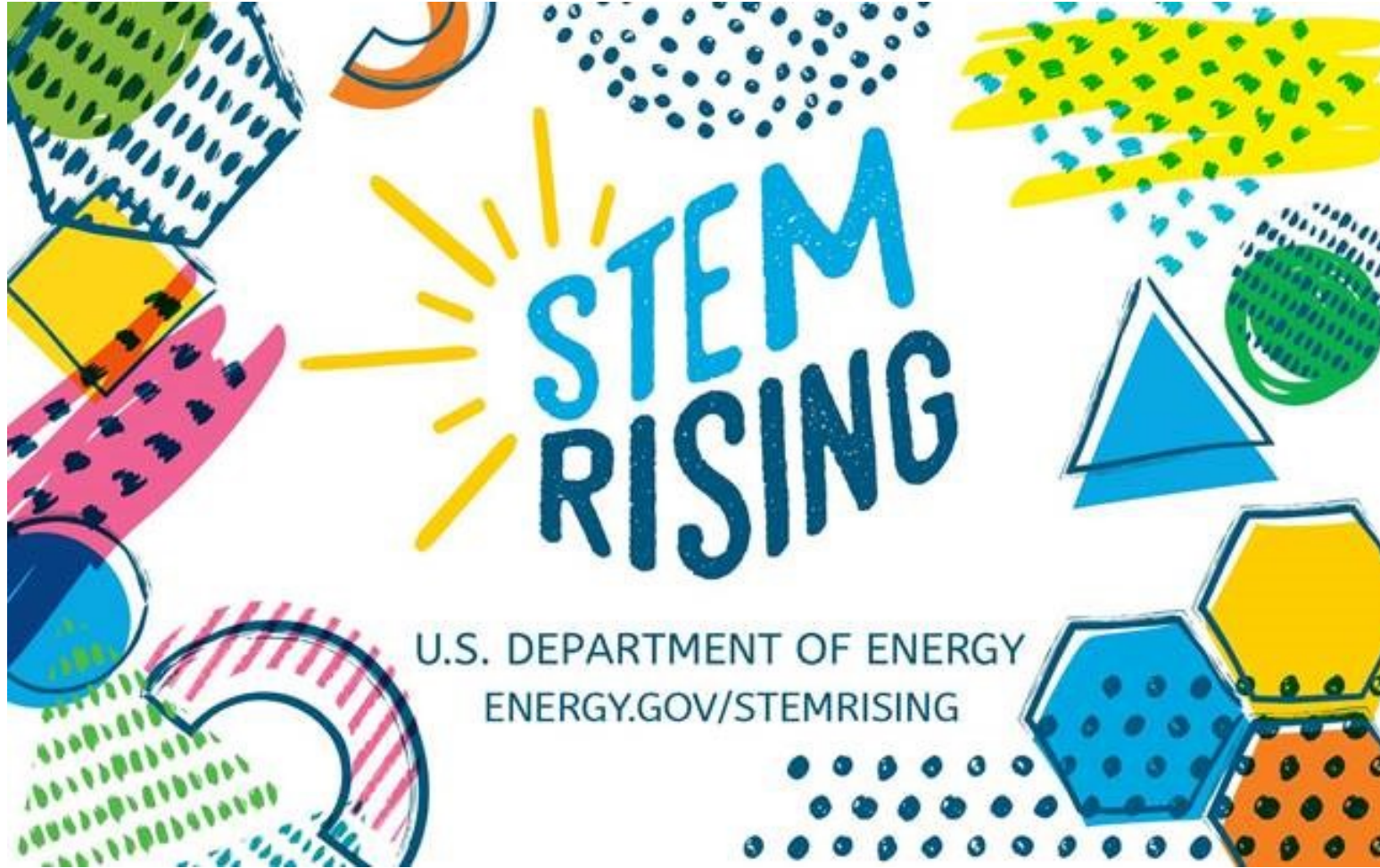
Images from STEM Partner in New Mexico



Photo by Jonelle, STEM Santa Fe

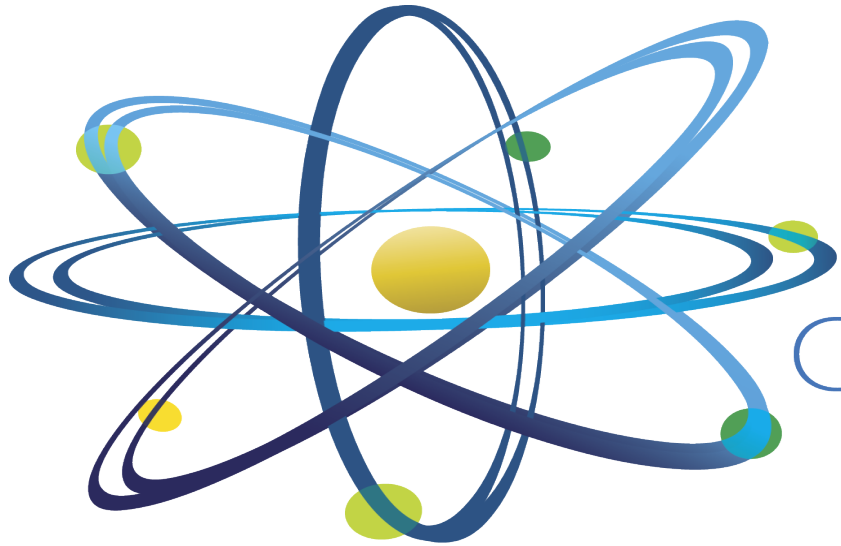


Photo by Lila, STEM Santa Fe



<https://www.energy.gov/articles/what-s-nuclear-science-week>

Questions?



Clean. **Reliable. Nuclear.**

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