

2021 VAST IN-PERSON PDI PLUS WORKSHOPS AND FIELD EXPERIENCES

(The PDI Plus is an Add-On to the Virtual PDI) (draft as of 08-14-2021)



“Science, Systems, Solutions”

FRIDAY, NOVEMBER 19, 2021

Field Experience

Time: 2:30pm-5:30pm

From Bedrock to Concrete: Science, Systems, and Solutions to Transportation Challenges

Frazier Quarry North Plant and Rockingham Precast

Have you ever wondered how the roads that got you to the PDI are engineered? Are you happy that your drive to Harrisonburg was smooth, free of washboard and potholed roads? How do engineers and planners use geoscience knowledge and the complexity of economics and supply chains to make such a happy drive possible? Well, come and learn! We'll drive deep into Frazier Quarry where we'll watch massive Earth moving equipment work, perhaps even witnessing some blasting of limestone! Then, we'll travel to Rockingham Pre-Cast where we'll see how such raw materials are transformed into some of the important transportation infrastructure that works behind the scenes to make our commutes smooth and safe. Attendees will be entered into a drawing to win, FREE, a large illuminated display cabinet of Virginia rocks and minerals for their school, donated by VTCA, with samples curated by the Friends of Mineralogy, Virginia.

Planetarium Show

Time: TBA

The John C. Wells Planetarium at James Madison University

Night on the Town

Time: 7:00pm

Science, Systems, and Solutions Scavenger Hunt

Enjoy some fun with friends as you hunt for solutions at participating locations in the fabulous city of Harrisonburg's downtown.

SATURDAY, NOVEMBER 20, 2021

Breakfast with the Awards Ceremony

Time: 7:30am, Location: Hotel Madison

Box Lunch and meetings with Affiliated Groups

Time: noon-1:00pm

JMU Professional Laboratory Experiences

Scheduled for Saturday morning and afternoon

Remy Pangle, Center for the Advancement of Sustainable Energy

Renewable Energy Demonstration Facilities – Learning by Example

Time: TBA

We will tour the wind and solar facilities on the JMU campus and discuss how they work and how they are used to educate students and the general public. We will also discuss ideas on how schools can get a wind/solar demonstration project at their school and how CASE can help. Participants will learn about an example of a renewable energy demo project, the likes of which they could implement at their school and programming that can be used with the demonstration facilities to encourage student learning and enhance their energy unit.

Kristen St. John, Geology and Environmental Science

Learning about Ocean Sediment Cores

Time: TBA

Ocean sediment cores are valuable archives of past climatic and environmental conditions. In this workshop you will have the opportunity to examine ocean sediment cores from the Gulf of Mexico that span a time period of major climate change. You will learn about some of the analytical tools used to make observations about the fossils they contain, grain size variations, and changes in elemental composition; and pose hypotheses to explain the observations. Participants will gain first-hand experience examining sediment cores to infer changes in past climate and environment.

Corey L. Cleland, Biology

Opportunities to Engage Students in Neuroscience Research

Time: TBA

High school students can benefit from participation in authentic research experiences, often available in faculty-led research programs at universities and colleges. The goal of this hands-on workshop is to acquaint educators with university-level Neuroscience research, provide an opportunity to explore experimental techniques, some of which can be integrated at low cost into K-12 teaching, and illustrate how high school students can productively contribute to scientific research.

Angel A. Garcia, Jr., Geology and Environmental Science

Geosciences Research Facility Tour

Time: TBA

During this tour, we are going to be visiting the department of Geology and Environmental Science research facilities and exploring some of the research our students and faculty are developing with the instruments.

Amy Goodall, Geographical Science

Appreciating Biodiversity Through Lab and Field Experiences

Time: TBA

Participants will gain experience in observing and measuring biodiversity that occurs close to their schools and in local neighborhoods and rural habitats. Experiences involve indoor lab and classroom activities and even outdoor activities, weather permitting.

Mike Renfro, Biology

Nature's Colorful Chemistry: Experiments with Plant Pigments

Time: TBA

In this workshop teachers will learn to extract plant pigments and demonstrate the effects of pH, and metal ions on the pigment coloration. All the materials used will be easily obtainable and safe for classroom use, whether in demonstrations or in experiments. Strategies for classroom experimentation will be discussed. Hands-on learning will be emphasized. Participants will learn how a wide array of colors can be generated from a single plant pigment and how a plant's environment influences plant coloration.

Adriana Banu, Physics and Astronomy

Radioactive Decay, the Alchemy of an Atomic Nucleus: Get a Half-Life!

Time: TBA

Radioactivity is a part of our everyday life. Naturally occurring radioactive materials are present in earth's crust, in the floors and walls of our homes, schools, or offices and in the food we eat and drink. There are radioactive gases in the air we breathe. Our own bodies - muscles, bones, and tissue - contain naturally occurring radioactive elements. All matter (solids, liquids, and gases) is composed of atoms. A chemical element is matter that is composed of only one type of atoms (i.e., hydrogen, carbon, oxygen, gold, uranium etc). Thus, an atom is the smallest particle of any chemical element that still retains the characteristics of the element. An atom can be characterized by the number of protons in its atomic nucleus. Some natural elements are unstable. Therefore, their nuclei disintegrate or decay into nuclei of atoms that belong to a new chemical element, releasing energy in the form of nuclear radiation. This physical phenomenon is called radioactivity. The radioactive atomic nuclei decay at a characteristic rate that remains constant regardless of external influences, such as temperature or pressure. The time that it takes for half the radioactive nuclei in a substance to disintegrate or decay is called half-life. This differs for each unstable chemical element, ranging from fractions of a second to billions of years. For example, the half-life of Iodine-131 is eight days, but for Uranium-238, which is present in varying amounts all over the world, it is 4.5 billion years. Potassium-40, the main source of radioactivity in our bodies, has a half-life of 1.42 billion years. This workshop will take place at the Madison Accelerator Laboratory (MAL), which is the facility that hosts JMU's own particle accelerator. At MAL electrons are accelerated to produce X-rays, which are further used for basic and applied research in a variety of fields, including nuclear astrophysics, materials science, geology, biology, archaeology or medical physics, to name a few.

Gina MacDonald, Chemistry and Biochemistry

Protein Unfolding: Integrating Outreach Demonstrations and Experiments

Time: TBA

Protein unfolding is associated with many neurological diseases such as Alzheimer's and Parkinson's disease. This workshop will demonstrate a protein unfolding outreach experiment that can be developed into ongoing student research projects. The outreach experiment clearly shows how students can observe protein unfolding and aggregation. A variety of samples will then be studied using infrared spectroscopy. Participants can observe how protein structure influences infrared spectra and better understand how spectroscopy can be used to better understand how environmental conditions can alter protein structure, stability, aggregation and disease progression.

Karris Atkins, X-labs

Design Thinking – Applied Math/Science Workshop

Time: TBA

This workshop will allow participants to work through the Design Thinking process in order to solve a "real world" problem. Participants will work in small groups to brainstorm solutions utilizing the available tools and resources in X-Labs.

Bob Kolvoord, Geographic Sciences

Mapping a Difference: Online GIS Activities for Science Classrooms

Time: TBA

Maps are a powerful way to visualize and analyze scientific data. In this workshop, you'll learn online tools to help you and your students make maps and perform spatial analysis. Good spatial thinking skills are a gateway to STEM careers and GIS is a great way to build those skills. Virginia leads the nation in using GIS in the classroom; come learn how you and your students can use cutting edge technology to improve problem-solving and critical thinking skills as you map a difference.

Perry Shank, Code VA

Data Science Using Scratch

Time: TBA

Data science is an important and growing field of computer science research and practice. Educational organizations have begun calling upon teachers to consider its role in students' educational experiences. In this session, we will explore how teachers might facilitate hands-on data science education experiences using the Scratch coding environment. By discussing how students might engage with data through project-based learning, we hope to catalyze creative data science teaching for everyone.

Bisi Velayudhan, Biology

TBA

Time: TBA

Ron Raab and Myron Blosser, Biotechnology Lab

Zone of Inhibition Test for Antimicrobial Activity

Time: TBA

Which hand sanitizer works best? Are any essential oils antibacterial? A Zone of Inhibition Test, also called a Kirby-Bauer Test, is a qualitative method used to measure antibiotic resistance and to test the ability of solids and textiles to inhibit microbial growth. This activity allows students choice in an experiment without specialized equipment. Session participants will set up the experiment and measure the zone of inhibitions to calculate antibiotic resistance of some common solutions.

Dr. Tom Devore

Chemistry is Magic

Time: TBA

Chemical reactions can produce color changes, material transformations and fire and flames. This presentation will present chemical reactions that do each of these, explain the chemistry behind each reaction, and give examples of how each is used in society.

Planetarium Show

Time: TBA

The John C. Wells Planetarium at James Madison University

Saturday Afternoon Field Experiences

3:15pm – 5:30pm

Black Run Stream Investigation at Purcell Park with the Chesapeake Bay Foundation

Purcell Park at 41 Monument Avenue

Join the Chesapeake Bay Foundation on a field experience at Blacks Run. Participants will learn about the process of restoring an impaired stream and conduct water quality tests and a macroinvertebrate study to see the benefits firsthand. Our investigation will model an inquiry-based, participant led program that is the hallmark of Bay Foundation education. Note: Participants should wear closed-toed shoes that can get wet, in addition to wearing field-appropriate clothing. No crocs, please. Participants should also dress appropriately for the weather conditions and bring water to drink.

High-Altitude Balloon Launch

TBA

Tour of the Edith J. Carrier Arboretum

Frances Plecker Education Center

The Edith J. Carrier Arboretum, a woodland sanctuary on the James Madison University campus, is a public urban garden and forested greenspace that preserves native plant species, provides opportunities for research, and promotes knowledge of the botanical and natural world for people of all ages.

Thomas Harrison House with archaeologist Dr. Carole Nash

TBA