

# GELFAND OUTREACH

**Rigorous - Educational - STEM Focused - Hands-on - Fun**

Spring 2022 Saturday Series Classes - Carnegie Mellon University

All Gelfand Outreach Spring Saturday Series Classes are \$55 per class from 9AM to noon. Scholarship funds are available through gifts from several Carnegie Mellon alumni. Please see last page to learn more.

**NOTE: Strict COVID-19 mitigation requirements will be in place; all students and instructors will be required to wear masks. There is NO eating or drinking allowed in classrooms during Gelfand Outreach programs.**



Keith Phuthi

## **BATTERIES! GET WIRED! GRADES 3-5**

March 19<sup>th</sup>

Batteries are in cell phones, remote controls, watches, cars and basically every device! If you've ever wondered what makes batteries work, this is the place to do it. This workshop will introduce the basics of how batteries are sources of energetic electrons which are used to power devices. The basics of circuits, voltage, charge and current will be introduced and related to energy and power through hands-on activities. Students will get to use and measure properties of different batteries and learn how to choose the correct battery for a given application.

**Keith Phuthi** is a graduate student in mechanical engineering at CMU and has an undergraduate degree in physics from MIT. His research focuses on computational modelling of materials for applications in energy storage devices such as batteries and is interested in energy systems in general. He has a passion for giving people from diverse backgrounds exposure to accessible science in the hope of spurring their interest. He believes that while learning will not always be easy, it can always be enjoyable with the right environment, motivations, and people around students. Keith has consistently taught K-12 students in various programs since 2015.



Caroline Holmes

## **BIOSPHERES GRADES 3-4**

April 2<sup>nd</sup>

What is a biosphere? Learn the answer and much more! We will identify the components of a biosphere and discuss how each part contributes to the wellbeing of the ecosystem. Design your own ecosystem and explain the parts that are essential for it to thrive. You will then create your very own biosphere terrarium to take home!

**Caroline Holmes** is a second-year Dramaturgy major, minoring in English Literature and Culture. At CMU, she is involved in theatrical productions through the school of drama, and with student-led theatre across campus through Scotch'n'Soda and other independent projects. She works for the Leonard Gelfand Center as a Teaching Assistant and as a video editor for LGC virtual programs such as the GO STEM Show and other remote educational videos. As the daughter of an educator, she has always had a passion for education and creating opportunities for hands-on learning experiences for young students. In her free time, she enjoys dancing, singing, playing the violin, and crafting fun art projects!



Dr. Lynley Doonan

## **BLOOD TYPING GRADES 5-7**

February 19<sup>th</sup> at the Mellon Institute

Blood typing is of critical importance, especially if a transfusion is needed. In this project, we will explore blood and blood typing through a variety of techniques. Using synthetic blood, students will learn about how blood interacts with the body and how blood typing occurs. Students will conduct an experiment using antibodies to identify blood type followed by examination with slides of blood smears. This will ultimately let students identify the needed blood type for a mock transfusion.

**Dr. Lynley Doonan** joined the Department of Biological Sciences at Carnegie Mellon University as Special Faculty in 2018. She earned her Ph.D. at the University of Pittsburgh in Molecular, Cell, and Developmental Biological Sciences with a teaching minor and her B.S. in Biological Sciences at Carnegie Mellon University. She has been teaching introductory laboratory classes to expose students to a variety of basic biology laboratory techniques.



Shannon Werntz

## **BUG BOTS GRADES K-2**

February 19<sup>th</sup>, March 19<sup>th</sup>

Bounce your way into the exciting world of robots by exploring motion, power, and electricity. Discover the way motors and batteries operate. Discuss robots and bugs and then create a robot, explain how it moves, and take the robot home to share with your family and friends! Parents are invited to attend the Bug Bots parade at the end of class.

**Shannon Werntz** is a senior at CMU studying Decision Sciences and Business Administration. She is involved in research with CMU's Center for Behavioral and Decision Research, and is a teaching assistant with the Psychology Department. She has worked with the Leonard Gelfand Center's outreach program since her first semester at CMU, as a Saturday Session TA and an afterschool tutor at Assemble. She is also heavily involved in STEM outreach through FIRST Robotics; as a high school senior, Shannon initiated a \$2,500 FIRST program at her elementary school including 10 robotics teams, and she currently coaches the Girls of Steel high school FIRST team which meets on the CMU campus.



Yves Georgy Daoud

## **BUILD AN AUTONOMOUS ROVER GRADES 6-8**

March 19<sup>th</sup>

Have you ever wondered how robots on Mars navigate and explore the planet on their own? How do they sense the environment around them and avoid obstacles? This session will introduce you to the basics of robotics exploration by discussing perception and motion planning applied on a planetary rover. Use those skills to build and code a small robotics rover that perceives and avoids obstacles just as it would on other planets!

**Yves Georgy Daoud** is a second-year master's in science student at the Robotics Institute of Carnegie Mellon University. He is a member of the Resilient Intelligent Systems Lab (RISLab) where he works on improving the performance and safety of robots operating in challenging real-world conditions through state estimation under uncertainty. Before that, he graduated in 2020 from the American University of Beirut - Lebanon with a degree in mechanical engineering where he worked on interdisciplinary projects such as a concrete 3D printer, beehive monitoring system, delta robot for pick and place applications, and a smartphone app for road quality and CO2 monitoring. In his free time, he enjoys reading books, hiking in nature, and going caving.



Alex Gourley

## **BUILDING BLOCKS OF 3D PRINTING GRADES 3-5**

February 19<sup>th</sup>

What do Legos, sandcastles, and 3D printing have in common? In this workshop, we will explore how building up layers of material forms the foundation behind 3D printing. Through building up parts using different materials and techniques, students will learn about novel manufacturing methods while working to achieve goals with their built parts.

**Alex Gourley** is a first-year PhD student in mechanical engineering working on additive manufacturing at CMU. He was born and raised in Iredell County, North Carolina. Alex went to Duke University and double majored in mechanical engineering and chemistry. While at Duke he played on the football team as a center for the offensive line. He was a member of the Duke Motorsports team and worked one summer for a NASCAR team. Outside of his studies, Alex enjoys playing video games, music, and woodworking.



Max Sprigg-Dudley

## **COLORFUL CHEMISTRY CREATIONS GRADES 4-6**

January 29<sup>th</sup>

Have you ever wondered how your clothes, accessories, and foods get their color? Many are dyed using natural materials and processes dating back hundreds of years. Join us as we explore the history, economics, and chemistry of natural dyes including cochineal scales and a variety of vegetables and plants. The class features several exciting demonstrations to illustrate chemistry in action. Students will get to experiment, mixing substances and testing a variety of types of paper to determine their impact on color. Students will bring home many colorful creations of their own!

**Max Sprigg-Dudley** is a senior in the chemistry department at Carnegie Mellon. His career interests include the pursuit of sustainable practices in energy, water, and transportation. Max is currently doing research on water purification catalysis in the Collins Lab, and plans to pursue a master's degree in Engineering and Public Policy. Outside of class, Max sings bass in the D Flat Singers Choir, plays club ultimate Frisbee at CMU, and enjoys cycling around Pittsburgh. He is excited to share his passion for chemistry with the next generation of scientists!



Dr. Carrie Doonan

## **DNA DETECTION GRADES 6-8**

February 19<sup>th</sup> at the Mellon Institute

In this workshop we will use DNA agarose gel electrophoresis to detect DNA. The SARSCoV-2 is a novel coronavirus that has caused a world-wide outbreak of respiratory disease. In this SIMULATED test, we will use gel electrophoresis to detect the presence of SARS-CoV2 virus. We will learn how DNA agarose gel electrophoresis works to detect DNA samples. We will also learn about the structure of the SARSCoV-2 virus.

**Dr. Carrie Doonan** is the Director of Undergraduate Laboratories and a Teaching Professor in the Department of Biological Sciences at Carnegie Mellon University. She was educated at Chatham College (BS) and the University of Connecticut (Ph.D) and began her teaching career at Carnegie Mellon University in 1993. Her primary area of focus involves the teaching and administration of a range of experimental laboratories in the department. She is responsible for writing and developing experimental units, training of junior faculty and teaching assistants and is actively involved in all aspects of the undergraduate program. Dr. Doonan has adapted many of her curricular innovations for use in K-12 outreach and has been invited to present this work at regional and national forums. She served as a Biotechnology Institute National Biotechnology Teacher-Leader in 2003 and 2005 and was awarded the Julius Ashkin Teaching Award in the Mellon College of Science in 2000. She was also awarded the Mark Gelfand Award for Service Learning and Outreach in 2011.



Sophie Clarke

## FLUIDS & FLOW GRADES 7-9

January 29<sup>th</sup> and March 19<sup>th</sup>

Explore viscosity with hands-on experiments to determine the most viscous liquid. You will observe, compare, and contrast viscosity of a variety of liquids. We will focus on the human body's circulatory system and fluids with very different viscosities. We will conclude with a biomedical engineering design challenge. Will you be able to go with the flow? Join us to find out.

**Sophie Clarke** is a first-year, double Biomedical and Mechanical Engineering student. At CMU, she is involved with the Society of Women Engineers and the Robotics Club, where she is currently working with a team to create a robotic model of the human hand. Sophie has previous experience teaching STEM to children 4 to 16 years old at a summer camp and a nature center. In her free time, she enjoys reading, hiking, and spending time with her friends.



Courtney Daylong

## HEAR ME RAWR! GRADES K-2

January 29<sup>th</sup>

Have you ever wanted to understand more about dinosaurs? This workshop is for K-2 students to deepen their knowledge of dinosaurs, their existence, prehistoric life, their extinction, and the roles of paleontologists and archaeologists. Students will complete STEM based, hands-on activities such as simulated dinosaur bone excavation and fossil replication. They will also use their creativity and written work to better understand and respect the dinosaur world of the past, how it has shaped our current existence, and what implications that has on the future.

**Courtney Daylong** is a Carnegie Mellon University, Heinz College alum. She served as a Teaching Assistant for the Communications/Public Speaking course and holds a Master's in Public Management with a focus in Strategic Planning. She spent a decade in executive leadership as a District Manager and Regional Vice President in higher education and American Honda Motor Co. throughout the Midwest and California. She also completed some doctoral work from the University of Southern California in Public Policy and earned a Bachelor of Arts in Education. She is a certified Nutritionist/Health Coach from the Institute of Integrative Nutrition and an Instagram Influencer in health and wellness @mostlyplantmama with a monthly column in Inspiring Lives Magazine. She is on the Board of Directors for the Global Sisterhood and is a proud boy, homeschooling mama to three little ones.



Dr. Gizelle Sherwood

## HOMEMADE COSMETICS GRADES 5-7

April 2<sup>nd</sup>

The skin is the largest organ in the human body. It serves to protect us from environmental stresses and hazards. As such it is important that we understand this organ and how to protect and care for it. In this workshop, students will create homemade skincare products from lotions and lip gloss, to bath scrubs. This hands-on workshop will have students working in the lab and participating in lecture demonstrations to create their own formulation of a variety of over-the-counter homemade cosmetic products.

**Dr. Gizelle A. Sherwood** is currently an Associate Teaching Professor at Carnegie Mellon University. She earned her Ph.D. in 2008 where her research focused on the effects of aggregation on the photo-physics of oligomers related to MEH-PPV and CN-PPV. She primarily lectures Modern Chemistry, the sophomore year Analytical Chemistry labs as well as a Cosmetic Chemistry course. She is passionate about engaging students in discussion of the application of Chemistry to everyday life and has been involved in several outreach programs working with both the Boy Scouts of America and the Leonard Gelfand Center.



Guadalupe Quirarte

## LIQUID SCIENCE GRADES K-2

April 2<sup>nd</sup>

Normal liquids can do crazy things when you look at them in the right way. Did you ever think you could watch them crawl on top of or below other liquids? Float objects and sink them upon command! Come and perform experiments with acids and bases and discover a magic pitcher that changes between a pink and clear solution in a matter of seconds. As you try out these tricks, learn about cohesion and adhesion in liquids. You've never seen liquids this crazy!

**Guadalupe "Lupe" Quirarte** is a second-year PhD student in the mechanical engineering department at Carnegie Mellon. Her current research involves merging heat transfer physics, additive manufacturing (AM), and machine learning to improve AM measurement science. Before joining CMU, Lupe received her B.S. in Math and Physics from Harvey Mudd College in 2020. During her undergraduate years, Lupe conducted research at NIST and LIGO in quantum and astrophysics. Outside of research, Lupe enjoys baking, the outdoors, and sketching.

## MARVELOUS MACROMOLECULES GRADES 4-6

February 19<sup>th</sup>

The existence of life is dependent upon nature's ability to manufacture very large, complicated molecules such as DNA and proteins. The ability of chemists to prepare really big molecules called polymers in the laboratory has revolutionized the manner in which we live. In this workshop, students will explore a variety of polymers, their usefulness, and how to make them in a manner which demonstrates care for the environment. This hands-on workshop will have students working in the lab and participating in lecture demonstrations to explore the amazing world of polymer chemistry.

**Dr. Gizelle Sherwood** is the instructor for this class. Please see her biography on the previous page.



Above, students create natural dyes in the Colorful Chemistry Creations and their own bug robot in Bug Bots workshops.

## MECHANICAL ENGINEERING 101 GRADES 6-8

February 19<sup>th</sup>



Uche Agwu

What is “Mechanical Engineering” and what do “Mechanical Engineers” do? This Mechanical Engineering 101 workshop will give young aspiring mechanical engineers a glimpse into the topics and experiences that they might encounter in their academic and professional career. It will include hands-on activities demonstrating the mechanical design process such as brainstorming techniques, prototyping guidelines, and design validation. Students will hear about the origins and experiences of 3 Mechanical Engineering PhD students at CMU who come from a breadth of academic, research, and professional backgrounds within the Mechanical Engineering field.

**Uchechukwu “Uche” Agwu** is a PhD candidate in Mechanical Engineering at Carnegie Mellon University. He conducts research in Professor Kenji Shimada’s Computational, Engineering, and Robotics Laboratory (CERLAB) where he focuses on the design, analysis, and application of lattice structures and additively manufactured components to the aerospace industry. He hopes his research will help advance the efficiency of future spacecraft through the design and optimization methods used to reduce weight, maintain stiffness, and apply multi-functional purposes to specific spacecraft components. He received his B.S. in Mechanical Engineering at Santa Clara University in 2018 and his M.S. in Mechanical Engineering at Carnegie Mellon University (CMU) in 2020. When he’s not researching or working, Uche enjoys playing soccer, listening to music, cooking, and Latin dancing.



Morgan Chen

**Morgan Chen** is a first-year Mechanical Engineering doctoral student at Carnegie Mellon University, working in Professor B. Reeja Jayan’s lab to study novel ways to build and control materials, such as using microwave radiation to grow ceramic parts. His research work will help discover new manufacturing methods and material properties for creating efficient and sustainable technologies. Morgan graduated from The University of Texas at Austin with a bachelor’s degree and has also completed internships at companies such as Lockheed Martin, Dell, and Fathom5. Outside of school and work, he enjoys swimming, listening to music, and eating tacos.



Darren Cheng

**Darren Cheng** is a PhD student in Mechanical Engineering at CMU. His research currently focuses on the formation and growth of atmospheric nanoparticles, specifically building new instrumentation to measure particles in the 1-10 nm range. Before CMU, Darren completed his B.S. in Mechanical Engineering at the University of Michigan and worked at HP Inc as a process and tooling engineer for new inkjet cartridges.

## MICROSCOPIC WORLD OF CELLS GRADES 2-4

February 19<sup>th</sup> at the Mellon Institute



Emily Drill

What do a person, an onion, and bacteria all have in common? All of these, and all living organisms, are made of cells. Most cells are too small to see by eye, but in this workshop you will use microscopes to explore what cells from organisms including plants, yeast, and bacteria look like when you get really, really close. You will prepare samples on microscope slides and see what happens to cells when you change their environment. You will learn how microscopes work – and make one of your own to take home!

**Dr. Emily Drill** is an Assistant Teaching Professor in Biological Sciences at CMU. She has been teaching laboratory courses at CMU since 2012 in a variety of topics including genetics, cell biology, developmental biology, and neuroscience. She teaches high school students through summer programs including the Pennsylvania Governor’s School for the Sciences; recent projects include using CRISPR technology in yeast and testing natural antimicrobial products. She holds a Ph.D. in Neuroscience from the University of Pittsburgh and a B.S. from CMU.



Dr. Dimitrios Skarlatos

## SECURITY IN A COMPUTER WORLD GRADES 3-5

April 2<sup>nd</sup>

Computers are everywhere today from phones and tablets, to datacenters, to space! How do software and hardware come together to build secure systems? Let's find out! Discover the fascinating world of computing systems by learning how they work. Learn how software programs run on hardware, design your own instructions, and decipher secure passwords!

**Dr. Dimitrios Skarlatos** is an assistant professor in the Computer Science Department at Carnegie Mellon University. His research bridges computer architecture and operating systems focusing on performance, security, and scalability. He has received several awards for his research including the 2021 ACM SIGARCH & IEEE CS TCCA Outstanding Dissertation award, an ASPLOS Best Paper award, two MICRO Top Picks in Computer Architecture, and two MICRO Top Picks Honorable Mentions. He earned his PhD and MS from the University of Illinois at Urbana-Champaign and his BSc from the Technical University of Crete in Greece.



Dr. Carla Bevins

## STOCK MARKET GRADES 4-6

March 19<sup>th</sup>

What are stocks? How do people make decisions about buying stocks? See what it's like to be a stock trader by participating in a stock market simulation. Buy stocks, pay commissions, and trade stocks with your friends. We have a challenge for you: can you invest some "money" and turn it into a whole lot more? Play our game and find out!

**Dr. Carla Bevins** is an Assistant Teaching Professor of Business Communications in the Tepper School of Business at Carnegie Mellon University (CMU). Dr. Bevins taught in the School of Information Sciences at the University of Kentucky (UK) and as a Visiting Educational Scholar at Qingdao Technological University. She earned her B.A. in English and Creative Writing with a concentration in Public Relations from Butler University and her Ph.D. in Communications from UK. She holds Graduate Certificates from the UK in Health Communications, Medical Behavioral Sciences, Statistics, and Distance Education. At CMU, Dr. Bevins mentors undergraduate and MBA students and teaches Business Communications, Business Presentations, and Interpersonal Managerial Communication.

## SYMMETRY & STRUCTURES GRADES 4-6

April 2<sup>nd</sup>

Symmetry surrounds you. Look at your body, buildings and even the street. We will discuss symmetry in biology, architecture, and engineering. Once we discover the properties of symmetry, our challenge will be to build symmetrical structures to withstand force and turbulence. Are you up to the challenge?

**Sophie Clarke** is the instructor for this class. Please see her biography on page 4.

## WEDO ROBOTICS GRADES 3-4

January 29<sup>th</sup>

New and improved! Explore the world of robotics using the new LEGO WeDo 2.0 kit designed specifically for younger students. Build LEGO models that feature working motors and sensors, then program them to move and react to the world using an intuitive "drag-and-drop" interface. This class will include completely new build projects and programming challenges from previous semesters!

**Shannon Werntz** is the instructor for this class. Please see her biography on page 2.



*Above, students experiment with a heat source in Smog, Clouds & Climate and dig up dinosaur creatures in the Hear me RAWR! Workshops.*

## Gelfand Outreach Spring 2022 Saturday Series Classes

*Classes are \$55.00 each\* and are conducted from 9:00AM to noon unless otherwise noted, at Carnegie Mellon University.*

***NOTE: Strict COVID-19 mitigation requirements will be in place; all students and instructors will be required to wear masks. There is NO eating or drinking allowed in classrooms during Gelfand Outreach programs.***

***Please contact the [GelfandCenter@andrew.cmu.edu](mailto:GelfandCenter@andrew.cmu.edu) for Gelfand Outreach registration questions.***

### **January 29th**

*Gr. K-2: Hear Me RAWR!  
Gr. 3-4: WeDo Robotics  
Gr. 4-6: Colorful Chemistry Creations  
Gr. 7-9: Fluids & Flow*

### **February 19th**

*Gr. K-2: Bug Bots  
Gr. 2-4: **Microscopic World of Cells\***  
Gr. 3-5: Building Blocks of 3D Printing  
Gr. 4-6: Marvelous Macromolecules  
Gr. 5-7: **Blood Typing\***  
Gr. 6-8: **DNA Detection\***  
Gr. 6-8: Mechanical Engineering 101*

*\* These Classes take place at Mellon Institute*

### **March 19th**

*Gr. K-2: Bug-Bots  
Gr. 3-5: Batteries! Get Wired  
Gr. 4-6: Stock Market  
Gr. 6-8: Build an Autonomous Rover  
Gr. 7-9: Fluids & Flow*

### **April 2nd**

*Gr. K-2: Liquid Science  
Gr. 3-4: Biospheres  
Gr. 3-5: Security in a Computer World  
Gr. 4-6: Symmetry & Structures  
Gr. 5-7: Homemade Cosmetics*

*To apply for scholarship funds, please submit a copy of the first page of your IRS 1040 tax form from 2020.*