GELFAND OUTREACH

SPRING 2026 SATURDAY SERIES CLASSES

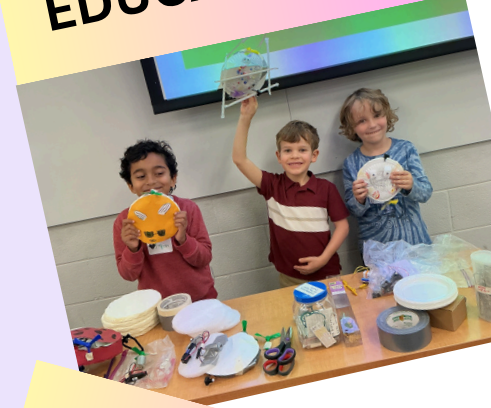### Carnegie Mellon University

Scholarship funds are available!

- Each class is $55
- Scholarship funds are provided through gifts from Carnegie Mellon University alumni

Full schedule can be found on the last page

STEM FOCUSED

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AI-ENABLED MOBILE HEALTH SYSTEMS

Grades 5-6, April 18

Today's health systems make it challenging to access medical resources. In this workshop we will learn how to transform smart devices like smartphones, speakers, watches, wearables and smart glasses, into personal medical devices that provide access to health testing.

Dr. Justin Chan

Dr. Justin Chan is an Assistant Professor in the Electrical and Computer Engineering Department and the Software and Societal Systems Department at Carnegie Mellon University. His research focuses on building intelligent mobile and embedded systems for computational health and large-scale environmental sensing. His work on smartphone-based ear infections is now FDA-listed and is available to select early access healthcare systems. His work on newborn hearing screening has led to an international effort called TUNE with the goal of bringing universal newborn hearing screening across Kenya as well as collaborations with NGOs such as the Global Foundation for Children with Hearing Loss to deploy this technology in Nepal and Mongolia. His work on contactless cardiac arrest detection has been licensed to a startup which has recently been acquired by Google. He was also a lead contributor for CovidSafe (now WA Notify), a COVID-19 contact tracing and symptom tracking app, which became part of official efforts by the WA Department of Health to manage the pandemic. He has authored publications in interdisciplinary journals like Nature Biomedical Engineering, Science Translational Medicine, Nature Communications as well as Computer Science and Engineering venues like MobiSys, MobiCom, SIGCOMM, SIGGRAPH Asia and UIST.

ALL ABOUT THE BRAIN

Grades 6-9, March 21

New to neuroscience? In this workshop you will get a comprehensive overview of how the brain works and what it does! Learn about how your body's different senses work and how your brain uses information about each sense to learn about the world around you. Students will also learn about the inner workings of the brain and how your brain controls your body's movements with electrical signals. We will have hands-on activities to explore your awesome brain in action!

The CMU Neuroscience Institute

Ani Gribbin, Ben Richardson, and Deying Song are all PhD students at Carnegie Mellon's **Neuroscience Institute**. As scientists, they research different aspects of how the brain works to control the body, with specialties in areas like vision, hearing, and mathematical modeling. As part of the neuroscience programs at Carnegie Mellon, they serve as teaching assistants, as well as being involved in science-related outreach programs. One of their shared passions is bringing accessible science to kids, and to inspire more young minds to join STEM fields like neuroscience.

BLOOD TYPING, DISEASES, AND DIAGNOSIS
Grades 6-8, February 21 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 blood type needed for a mock transfusion.

Dr. Lynley Doonan

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.

BONE FRACTURE
Grades 7-9, April 18

How much force does it take to cause a fracture in a bone? We will answer that question in this workshop! We will perform dissections, extract bones of interest, compare the shape of animal bones to humans, and measure the force required to break bones.

Dr. Axel Moore

Dr. Axel Moore is an Assistant Professor of Biomedical Engineering at Carnegie Mellon University. He earned his Ph.D. from the University of Delaware, where he discovered and established a new theory of fluid recovery in articular cartilage. Following this, he joined Imperial College London as a postdoctoral fellow to develop biomaterials capable of mimicking the normal functions of bone and cartilage. Finally, prior to joining CMU, he was a Biomedical Research Scientist at the University of Delaware, where he developed a pre-clinical large animal model of scoliosis. Dr. Moore's current research applies acute and chronic in vivo loading to both quantify and modulate the function of orthopedic tissues, with a special interest in articular cartilage and spine.

BRAINS & AI, ORIGAMI & ILLUSIONS

Grades 3-5, March 21

How do brains work? Does AI work the same way? We'll understand neural networks with fun, physical activities, and no computers. Origami, measuring the speed of thought, mind-bending illusions, and computers that compute with marbles, gears, trains, or even us!

Dr. Xaq Pitkow

Dr. Xaq Pitkow is an associate professor of computational neuroscience at Carnegie Mellon University studying the principles of intelligence in brains and machines. He is also associate director of the Institute for Artificial and Natural Intelligence (ARNI). He has given dozens of talks to kids and non-scientists in schools and museums about how brains and AI work. Xaq has been a professional graphic artist since age 12 and loves improvising music on a variety of instruments. He loves cultivating curiosity in kids.

BUG BOTS

Grades K-2, January 24

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. (See instructor bio below)

BUILDING WITH STICKS AND STRAWS

Grades K-2, April 18

Let your creative juices flow and build with items found around your house. We will discuss structures and shapes and students will have the opportunity to build their own structures. Students will first learn about the basic principles of engineering, the process of design, and structural fundamentals that are used by architects and engineers alike. We will build a variety of structures using cardboard, pipe cleaners, bamboo skewers, toothpicks, tape, and straws. Caution, construction ahead!

Teddi Bishop

Teddi Bishop is a Master's student at Carnegie Mellon University, studying biomedical engineering. Teddi has worked for the Leonard Gelfand Center as a teaching assistant and an office member for the last four years, organizing and preparing classes during her undergraduate program. She previously conducted research in a laboratory at the University of Pittsburgh where she co-authored a paper studying the interactions between T-cells and breast cancer cells using microfluidics. Teddi is also a proud member of the second Rales cohort at CMU. For the past three summers, Teddi has worked as a research and development engineering intern for Procter and Gamble. She looks forward to returning to P&G to work full time as an engineer in the healthcare department in summer of 2026.

BUILD-A-JUNCTION: SIGNAL RELAY CHALLENGE

Grades 3-5, April 18

In this workshop, students act as cellular teams tasked with engineering a communication network to transmit messages between "cells" under biological constraints. They design physical relay systems while adapting to hidden "mutation cards" based on real connexin variants that introduce unpredictable challenges—like blocked pathways, leaky channels, or misfolded proteins. The activity combines teamwork, strategy, and chaos to demonstrate the complexity and adaptability of intercellular communication.

Dr. Liz Ransey

Dr. Liz Ransey is an assistant professor in the Department of Biological Sciences at Carnegie Mellon University. Her research explores how connexin proteins govern intercellular communication, with a focus on engineering gap junctions to understand and modulate signaling in cancer and the nervous system. Before her faculty appointment, she was a postdoctoral associate in the Department of Neurobiology at Duke University. She earned her PhD in Chemical Biology from Harvard University, following doctoral work at Carnegie Mellon University. Her work integrates biochemistry, structural biology, and protein engineering to develop novel tools for probing isoform-specific communication in complex tissues. Dr. Ransey is the recipient of the NSF Graduate Research Fellowship, the UNCF/Merck Graduate Research Fellowship, and postdoctoral fellowships from the Hartwell Foundation and the Ernest E. Just Life Sciences Institute.

CHEMISTRY OF SHAMPOO

Grades 4-5, February 21 AT THE MELLON INSTITUTE

With all the hair products on the market, do you ever wonder what makes a good shampoo? Does your shampoo work the best? What does "work the best" mean? In this lab, you will test shampoos by testing the pH, the percent of solids, flash foam formation, foam retention, relative viscosity, India ink dispersion, and the cost of the shampoo. After you have completed each of the tests, we will graph and compare the data on all the shampoos, and as a class, determine which shampoo works best on your hair. You may bring your own shampoo to test, and there will also be shampoo samples in the lab to test.

Dr. Carrie Doonan

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, and the Richard Moore Award in 2022.

CODING FOR BEGINNERS

Grades 2-4, January 24

Have you ever wondered how computers make decisions? In this course we will learn how computers follow routines and instructions to complete a final task. Coding can seem like a lot of complicated numbers, so we will teach through fun activities where students perform everyday tasks to simulate how a computer 'thinks.' Kids will act as both a person instructing a computer, and as the computer interpreting its instructions. The purpose of this course is to introduce coding concepts with off-line instructional activities.

Gillian Gold

Gillian Gold is a Ph.D. student at Carnegie Mellon's Human-Computer Interaction Institute (HCII). Her research focuses on how technology can support effective, practice-first learning environments in STEM education. She previously studied cognitive science and computer programming at Yale University. In her free time, Gillian enjoys meeting friends for coffee, reading, and exploring new restaurants in Pittsburgh.

COMMUNICATING WITH PEOPLE AND AI

Grades 4-6, March 21

How do we choose our words when we communicate with each other? Should it be different with AI? Through guessing games and hands-on activities, we explore strategies for interacting with AIs like ChatGPT – and each other!

Dr. Maarten Sap and Dr. Daniel Fried

Dr. Maarten Sap is a professor at Carnegie Mellon University who studies how to make artificial intelligence (AI) more socially intelligent, fair, and safe. His research explores how AI can better understand people and use language responsibly. He also works on ways to reduce bias and promote positive social outcomes through technology.

Dr. Daniel Fried is a professor at Carnegie Mellon University who studies how to help AI understand and use human language. He explores how people can use everyday language to get computers to help with useful tasks like programming or navigating the web, making it easier for computers and people to work together.

DNA AND EVOLUTION

Grades 4-6, February 21 AT THE MELLON INSTITUTE

You may have heard of DNA, but have you ever wondered what DNA looks like and what its job is? DNA is what makes you you, a strawberry a strawberry, and is what made a T-rex a T-rex. We will explore how DNA functions and changes by mutation, and how DNA mutations cause animals on Earth to evolve and change. In this activity, you will get to break apart the cell membrane of a strawberry and extract its DNA. You will get to see, touch, and take home actual DNA. You will get to see and touch diverse types of live animals and put together a tree to show how they are related to one another, like a family tree. Finally, you will be able to play games to explore how evolution happens by a process called natural selection.

Dr. Amber Laperuta

Dr. Amber LaPeruta is a special lecturer at CMU where she teaches Evolution and introductory laboratory classes. She earned her Ph.D. from Carnegie Mellon University in Molecular Biology and Genetics and her B.S. in Biological Sciences from Stevenson University where she minored in Mathematics and Chemistry.

DNA DETECTION

Grades 6-8, February 21 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. Amanda Willard

Dr. Amanda Willard joined the Department of Biological Sciences at Carnegie Mellon University as Director of Undergraduate Studies in 2020. She earned her Ph.D. at Carnegie Mellon University and her B.S. in Biology at Seton Hill University. She serves as the primary academic advisor for undergraduate students majoring in biology and enjoys teaching introductory courses including a first-year laboratory course aimed at exposing students to a variety of basic biology laboratory techniques and a sophomore seminar course that exposes students to the variety of research and career options within the field of biology.

FROM PHOTONS TO PHOTOS

Grades 6-9, April 18

This class provides a first introduction to photography, optics, and imaging. We will begin by investigating properties of optical elements such as lenses, prisms, and filters, and see how we can use them to manipulate light. Then, we will go over how digital image sensors work and look at the internals of a digital camera. We will use this background to understand the various settings (focus, zoom, exposure) and stages (optical, analog, digital) of the modern photography pipeline. In parallel, we will get hands-on experience with all these concepts using high-end digital cameras, including a photography competition at the end.

Dr. Ioannis Gkioulekas

Dr. Ioannis Gkioulekas is an assistant professor at the Robotics Institute of Carnegie Mellon University, where he has been since 2017. Before that, he was a PhD student at Harvard University, and even before that an undergrad student at the National Technical University of Athens, Greece. He works on computational imaging, which can be broadly described as coming up with systems that combine imaging (optics, sensors, illumination) and computation (physics-based modeling and rendering, inverse algorithms, learning) in innovative, unexpected, and meaningful ways. Particular problems he is interested in, include imaging around walls or through skin, material acquisition, differentiable rendering, and the integration of physics-based simulation, learning, and optics. He is also more broadly interested in computer vision and computer graphics. For his work he received the Best Paper Award at CVPR 2019, a Sloan Research Fellowship, and an NSF CAREER Award.

GREEN GENIUS

Grades 4-6, January 24

Become a Green Genius as you explore the science behind sustainability! Build your own water filtration system and learn about composting. Unleash your creative side with up-cycled collages and crafts from reusable materials. This workshop blends STEM, art, and problem-solving for a fun, interactive look at how you can help protect the planet!

CMU Sustainable Earth Organization

Sustainable Earth is Carnegie Mellon's primary undergraduate environmental organization. We focus on strengthening environmental initiatives on campus and in Pittsburgh. Our work focuses on advocacy, technology-driven solutions, and community-centered events. We also maintain our student-run campus garden, which serves as a place for community building and hands-on learning.

HOMEMADE COSMETICS

Grades 3-5, March 21

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

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 MEHPPV 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.

Bella Ballin

Bella Ballin is currently a Lab Instructor in the Department of Chemistry at Carnegie Mellon University. After graduating with her BS from Chemistry in 2020. She joined the undergraduate teaching labs where she works with professors to teach students laboratory skills in General, Analytical and Organic Chemistry. She is passionate about supporting students while they learn hands-on techniques and has been involved in several outreach programs including Science Olympiad and Leonard Gelfand Center activities. She also enjoys bringing chemistry to life at home with her daughter.

IT'S ALIVE! THE SCIENCE BEHIND MAKING LIVING ROBOTS

Grades 6-8, January 24

How do you make robots more like animals? How do muscles work? How do you keep cells alive outside the body? The answer to all these questions and more are in this session! Learn about bioinspired robots, cyborg robots, and muscles. Explore hands-on how electricity can control your muscles and build a syringe-powered robot!

Biohybrid and Organic Robotics Group

This class will be taught by members of the **Biohybrid and Organic Robotics Group** at CMU. Animals have long served as an inspiration for robotics. However, many of the mechanical properties, physical capabilities, and the behavioral flexibility seen in animals have yet to be achieved in robotic platforms. Towards addressing this gap, research in the CMU Biohybrid and Organic Robotics Group (B.O.R.G) focuses on the use of organic Materials as structures, actuators, sensors, and controllers towards the development of biohybrid and organic robots. The research group's long-term goal is to develop completely organic, autonomous robots with programmable neural circuits. These robots will have future applications in medicine, search and rescue, and environmental monitoring.

LIQUID SCIENCE
Grades K-2, March 21

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? This class is an introduction to the chemical and physical properties of different liquids and will allow you to apply critical thinking skills and the scientific method to make observations about liquids. Learn about physical properties such as density, viscosity, cohesion, and adhesion by observing the behavior of different liquids. You've never seen liquids this crazy!

Teddi Bishop

Teddi Bishop is a Master's student at Carnegie Mellon University, studying biomedical engineering. Teddi has worked for the Leonard Gelfand Center as a teaching assistant and an office member for the last four years, organizing and preparing classes during her undergraduate program. She previously conducted research in a laboratory at the University of Pittsburgh where she co-authored a paper studying the interactions between T-cells and breast cancer cells using microfluidics. Teddi is also a proud member of the second Rales cohort at CMU. For the past three summers, Teddi has worked as a research and development engineering intern for Procter and Gamble. She looks forward to returning to P&G to work full time as an engineer in the healthcare department in summer of 2026.

THE MICROSCOPIC WORLD OF CELLS
Grades 2-4, February 21 AT THE MELLON INSTITUTE

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 learn how microscopes work, and how scientists use them for research. You will practice using microscopes to guess the identity of microscopy mystery samples. Then you will be the scientist, preparing samples on microscope slides to test hypotheses about what happens to cells when you change their environment.

Dr. Emily Drill

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; most recently, she worked with a group of students on a research project using CRISPR technology.

PRESSURE AND FLOW: WHAT MAKES BLOOD GO

Grades 6-8, March 21

Our hearts are very important. They pump blood through our whole body to give our organs the energy we need. But have you thought about the vessels the blood goes through? They're not just pipes, but they are living, growing and changing pieces of our bodies too. In this workshop, we'll talk about our blood vessels: what they're made of, how they help our heart keep blood flowing, and what can happen if they're not working properly. We'll build a simple experimental model of our aorta, the largest artery in our bodies, and then look at a computer program that uses math to explain how it works.

Jason Szafron

Dr. Jason Szafron is an assistant professor of Biomedical Engineering at Carnegie Mellon University. Professor Szafron received his BS in Biomedical Engineering from Texas A&M University, where he completed his undergraduate thesis on endovascular medical device design. He went on to receive his MS and PhD degrees in Biomedical Engineering from Yale University studying the computational optimization of polymeric scaffolds for tissue engineered vascular grafts. As a postdoctoral research fellow in the Department of Pediatrics at Stanford University, he worked on experimental and computational methods for quantifying mechanobiological changes during the progression of pulmonary arterial hypertension.

SLIME IS SUBLIME!

Grades 3-5, January 24

Non-Newtonian liquids are everywhere in our bodies, food, and in nature. They have surprising properties that make them useful for engineering and medicine. This class will explain what makes slimy fluids move and flow the way they do. We will talk about the different molecules that make up different liquids, to understand how the mixtures of different molecules can have new properties. We will use the "reverse-pinch test" to discover which liquid is the most elastic.

Dr. Derin Sevenler

Dr. Derin Sevenler joined the Carnegie Mellon University Department of Chemical Engineering as an assistant professor in 2024. His research addresses problems at the interface of biotechnology and fluid mechanics. His interests include microfluidics, non-Newtonian and complex fluids, biomaterials, gene & drug delivery, nano-optics, and molecular diagnostics. Sevenler received his Ph.D. in biomedical engineering from Boston University and his BS in mechanical and aerospace engineering from Cornell University. From 2018 to 2022, he was a postdoctoral fellow in the laboratory of Mehmet Toner at Massachusetts General Hospital. Before joining Carnegie Mellon University, he was an instructor in the Center for Engineering in Medicine & Surgery at Massachusetts General Hospital and Harvard Medical School. Sevenler is a recipient of the NIH Pathway to Independence Award.

USING DNA FINGERPRINTING IN FORENSICS

Grades 5-7, February 21 AT THE MELLON INSTITUTE

DNA fingerprinting allows forensic scientists to compare crime scene DNA to suspect DNA in a case. In this project, we will learn about how differences in our DNA can be used like "fingerprint" to identify individuals. DNA can be obtained from a single hair left behind at a crime scene. We will work with DNA isolated from hair from a mock crime scene and compare it to mock suspect DNA. We will learn essential lab skills like micropipette and use techniques that real forensic scientists use to solve our mock case.

Brian Corletti

Brian Corletti is a research assistant in the Undergraduate Biology Laboratories at Carnegie Mellon University, where he assists with experimental setup for laboratory courses. Brian holds a Bachelor of Science degree in Geology from Allegheny College. Currently, he is a biology research assistant pursuing graduate studies. He has been serving as a teaching assistant in the biology undergraduate laboratories for the past two years.

GELFAND OUTREACH

SPRING 2026 SATURDAY CLASSES

Each class is $55*
Classes take place from 9:00 AM - Noon
on the Carnegie Mellon campus

*To apply for scholarship funds, please submit a copy of the first page of your IRS 1040 tax form from 2024.

January 24th

- Gr. K-2: Bug-bots
- Gr. 2-4: Coding for Beginners
- Gr. 3-5: Slime is Sublime
- Gr. 4-6: Green Genius
- Gr. 6-8: It's Alive! Science Behind Living Robots

March 21st

- Gr. K-2: Liquid Science
- Gr. 3-5: Brains & AI, Origami & Illusions
- Gr. 3-5: Homade Cosmetics
- Gr. 4-6: Communicating with People and AI
- Gr. 6-8: Pressure & Flow: What Makes Blood Go
- Gr. 6-9: All About the Brain

February 21st
CLASSES HELD AT MELLON INSTITUTE

- Gr. 2-4: Microscopic World of Cells
- Gr. 4-5: Chemistry of Shampoo
- Gr. 4-6: DNA and Evolution
- Gr. 5-7: Using DNA Fingerprinting in Forensics
- Gr. 6-8: DNA Detection
- Gr. 6-8: Blood Typing, Diseases, and Diagnosis

April 18th

- Gr. K-2: Building with Sticks and Straws
- Gr. 3-5: Build-A-Junction
- Gr. 5-6: AI-Enabled Mobile Health Systems
- Gr. 6-9: From Photons to Photos
- Gr. 7-9: Bone Fracture

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