

GELFAND OUTREACH

FALL SATURDAY 2024 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 class schedule can be found on last page.

STEM FOCUSED

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gelfandcenter@andrew.cmu.edu

BRAIN-BOTS

Grades 6-8, September 21

How does the brain work to control your body? In this workshop you will have the opportunity to learn about the inner workings of the brain. We will discuss how our brains use electrical impulses to generate our thoughts, actions and behavior with a focus on how the brain controls our muscles. The electrical signals the brain uses to control your body can even be used to control a robot! There will be hands-on activities to explore your awesome brain in action.



Eve Ayar, Rawan Fakhreddine, Emily Lopez and Luz Andrino

Eve, Emily, Rawan, and Luz are all Ph.D. students at Carnegie Mellon's Neuroscience Institute. As scientists, they research different aspects of how the brain works to control the body and senses, with specialties in areas like vision and hearing. 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.

BUG-BOTS

Grades K-2, September 21

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.



Reed Luttmmer

Reed Luttmmer is a fourth-year student at Carnegie Mellon University, majoring in Mathematical Sciences. They are a head teaching assistant within CMU's School of Computer Science, a research assistant for CMU's Infant Cognition Lab, and the community development chair of the CMU Math Club. Reed has worked in a variety of childcare settings, including as a tutor, quiz bowl coach, ski instructor, and most recently, a supervisor at an overnight camp for children with social, emotional, and behavioral challenges. For fun, Reed enjoys reading, going for walks, playing quidditch, and spending time with friends and family. Reed is passionate about sharing their love of STEM with others, and they are excited for this to be their fourth year working with the Leonard Gelfand Center!

BUILDING BLOCKS OF 3D PRINTING

Grades 3-5, September 21

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

Alex Gourley is a Ph.D. 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.

CODING FOR BEGINNERS

Grades 2-4, October 26

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.



Teddi Bishop is a fourth-year student at Carnegie Mellon University, double majoring in chemical and biomedical engineering. Teddi works for the Leonard Gelfand Center as a teaching assistant and an office member where she organizes and prepares the classes. She also conducts research in a laboratory at the University of Pittsburgh where she works with PDMS microfluidic devices and breast cancer cell spheroids to study the interactions between T-cells and cancer cells. During the summer of 2023, Teddi worked as a research and development engineering intern for Procter and Gamble. In the future, she plans on pursuing a fifth year master's degree in biotechnology and Pharmaceutical Engineering.

COMPLEX FLUID TOYS

Grades 3-5, November 9

Is slime a liquid or a solid? What about orbeez? In this workshop we will explore the world of complex fluids, which are materials that aren't quite solids, but aren't quite liquids either! We'll learn all about the chemistry that makes these types of materials squishy and gooey, along with how chemical engineers use these materials to make products we use every day.



Dr. Joanne Beckwith Maddock is an assistant teaching professor in the Department of Chemical Engineering at Carnegie Mellon University. She earned her Ph.D. from the University of Michigan where she studied bacterial and fungal biofilms which are a common cause of medical device infections. She also worked as a manufacturing engineer at a company that makes paint pigment. Currently, she teaches Intro to Chemical Engineering, and the Chemical Engineering Lab courses. She is passionate about helping students understand the impact that chemical engineering has on their everyday lives and the wide range of job opportunities a degree in chemical engineering offers. When she is not teaching, you can find her going for a run or rock climbing.

DIGITAL PHOTOGRAPHY

Grades 7-9, September 21

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 take a 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 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 undergraduate 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. He is also more broadly interested in computer vision and computer graphics. He has received the Best Paper Award at CVPR 2019, the NSF CAREER Award, and the Sloan Research Fellowship.

HOW DOES THE BRAIN WORK?

Grades 4-6, October 26

In this class, you will see and touch real human brains and will then learn how the brain works to allow us to speak, hear, walk, talk and think. You will also learn about the methods we use to study the human brain and the spectacular progress made in understanding brain function in the last 10 years.



Dr. Marlene Behrmann

Dr. Marlene Behrmann is a Professor of Psychology at Carnegie Mellon University, whose research specializes in the cognitive basis of visual perception, with a specific focus on object recognition. Dr. Behrmann received her B.A. in speech and hearing therapy in 1981, followed by her M.A. in speech pathology in 1984, both from the University of Witwatersrand in Johannesburg, South Africa. She then received a Ph.D. in Psychology from the University of Toronto in 1991. Dr. Behrmann is widely considered to be a trailblazer and a worldwide leader in the field of visual cognition.

HOW TO SET HOMEWORK GOALS

Grades 6-9, October 26

Setting goals to practice regularly is essential for homework success. In this workshop, you will learn how to set homework goals, focusing on mathematics. This will include guided activities reflecting on how you currently do your homework and developing strategies for improving your homework routines. The focus is on strategies that make setting goals easy, fun, and rewarding. You will be given access to virtual tools developed at CMU that help you set practice goals for your homework and receive feedback on the difficulty of the goals you set. This tool is actively being developed, so we are looking forward to your feedback. The workshop will include complimentary access to tutoring systems for math practice you can use on your phone or laptop.



Conrad Borchers

Conrad Borchers is a Ph.D. student at the Human-Computer Interaction Institute (HCII) at CMU's School of Computer Science. Before coming to CMU, he lived in Germany, England, and the Czech Republic. Conrad's doctoral research involves exploring novel technologies designed to support students and their caregivers with homework. He is excited about helping learners use technology to grow. In his free time, he enjoys playing the piano and learning languages.

HOW ENGINEERS MAKE PLANES FLY

Grades 3-5, September 21

Discover how planes fly and how engineers use Computational Fluid Dynamics (CFD) in plane design. Design your own wing and then test it in a "wind tunnel". What shape will produce the best wing? What shapes produce no lift? Fly in to find the answers to these questions and more!



Craig Weeks

Craig Weeks is a PhD student in mechanical engineering working on computational fluid dynamics modeling of metal additive manufacturing processes. He is from Portland, Oregon and completed his undergraduate studies at Oregon State University, where he majored in mechanical engineering with a double minor in aerospace engineering and computer science. Craig was part of the hybrid and liquid-engine rocket teams at Oregon State, and interned at the NASA Glenn Research Center in Cleveland, OH working on electric aviation. In his free time, Craig enjoys trail running, playing piano and guitar, and discovering hikes in and around Pittsburgh.

INTRODUCTION TO AERODYNAMICS

Grades K-2, October 26

Up, up and away we go! In this workshop you will fly back to the past and learn a brief history of the invention of airplanes. Then you will soar into the present and become engineers to create your very own paper airplanes. You will explore the different types of planes and materials used in making planes. Be prepared for a terrific flight!



Krista Aylwin

Krista Aylwin is originally from California, and she earned her BA in Child Development from California State University, Chico. After graduating, Krista moved to Pittsburgh and became the Lead Teacher in the Twos Classroom at Eastminster Childcare Center and at Carriage House Children's Center. She also taught English in Southeast Asia at the National University of Laos in Vientiane, Lao PDR. She is a preschool fours teacher classroom at Carnegie Mellon University, Children's School. Krista enjoys planning future travels, touring historical homes, creating embroidery projects, baking a new recipe and trying to keep her house plants alive. She currently volunteers with the organization Prism working with internationals as an English Partner. On the weekends, you can catch Krista hanging out with friends, exploring the wonderful parks of Pittsburgh or enjoying time at home with a good book.

LIQUID SCIENCE

Grades K-2, November 9

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 fourth-year student at Carnegie Mellon University, double majoring in chemical and biomedical engineering. Teddi works for the Leonard Gelfand Center as a teaching assistant and an office member where she organizes and prepares the classes. She also conducts research in a laboratory at the University of Pittsburgh where she works with PDMS microfluidic devices and breast cancer cell spheroids to study the interactions between T-cells and cancer cells. During the summer of 2023, Teddi worked as a research and development engineering intern for Procter and Gamble. In the future, she plans on pursuing a fifth year master's degree in biotechnology and Pharmaceutical Engineering.

MARVELOUS MACROMOLECULES

Grades 3-5, November 9

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 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.

MATH TURNED INSIDE-OUT

Grades 5-7, September 21

In this workshop students will be introduced to the basic ideas of topology, a field of mathematics that is becoming increasingly crucial to physics and engineering. It is the study of how spaces are organized and how they are structured and whether they can be smoothly deformed into each other or not. Through hands-on exercises, students will construct topologically inequivalent objects, like cylinders and moebius strips and examine them to discover and understand their differences.



Dr. Shubhayu Chatterjee

Dr. Shubhayu Chatterjee joined the Department of Physics at Carnegie Mellon University as an Assistant Professor in January 2023. His research focuses on emergent phenomena in condensed matter physics and tries to understand novel behavior which results from the sheer scale and complexity of billions of interacting particles in everyday materials. He also studies how to use tools from the quantum information community to sense such emergent phenomena. Prior to joining CMU, he was a postdoctoral fellow at UC Berkeley. He received his PhD in Physics from Harvard University, and holds an integrated master's in physics from the Indian Institute of Technology Kanpur.

THE MICROBIAL WORLD AND HUMAN HEALTH

Grades 5-7, November 9

We are living in a microbial world. Can you imagine how many different microbes are around us or inside our body? In this project, we will introduce basic concepts of what microbes are and how they communicate with us. We will learn that some microbes are beneficial to our health while other microbes can cause diseases. The project will also consist of a hands-on lab session to help students identify microbes on our body parts and in our environment. Students will also learn how to grow bacteria and maintain a sanitary habit. Ultimately this project will let students gain new insight into the microbial world and how we should live harmoniously with it.



Dr. Zheng Kuang

Dr. Zheng Kuang is an assistant professor in the Department of Biological Sciences at Carnegie Mellon University. He received his Ph.D. and MHS degrees from Johns Hopkins University. After that, he joined Lora Hooper's laboratory as a postdoctoral fellow at the University of Texas Southwestern Medical Center. His lab at Carnegie Mellon focuses on how gut microbes regulate mammalian circadian rhythms in metabolism and immunity. He is also interested in exploring epigenetic pathways that integrate microbial and circadian signals to regulate mammalian health and disease. This work is the basis for an NIH Director's New Innovator Award, a K99/R00 Pathway to Independence award and a Charles E. Kaufman Foundation award. Dr. Kuang's work has been published in *Science*, *Nature Structural & Molecular Biology*, *Genome Research*, *eLife* and *Nucleic Acids Research*.

NATURE'S ARCHITECTS: EVOLUTION AND ACTION

Grades 4-6, November 9

Have you ever wondered why you feel cooler when the wind is stronger? Or why some people can digest dairy products while others cannot? Did you know, earthworms manifestly thrive in the soil, but their physiology is poorly suited for terrestrial life? Although seemingly unrelated, these phenomena share a common underlying explanation; organisms can affect their own and others' characteristics by "constructing" their own habitats. In this class, we will aim to understand how nature's architects can drive the process of biological evolution, drawing on in-class activities and natural examples, which you will see play out in real time!



Joseph Prentice

Joseph Prentice is a research associate in the Bridges lab (Department of Biological Sciences), where he is currently working on mathematical models of niche differentiation and the emergence of metabolic cooperation in populations of bacteria and their viruses (phage). Broadly, Jojo is interested in how ecology and evolution interact to produce novel traits among species in complex biological communities. Outside of work, he enjoys rock climbing, running, and reading. He is looking forward to teaching his first Gelfand Center class!

PROGRAM USING ALICE VR

Grades 5-8, October 26

Alice is a free platform for coding and animation. In this class you will learn to create 3D Projects with Alice 3 and export them to VR. This is a hands-on class requiring some familiarity with block coding using platforms like Scratch or Code.org. You will brainstorm, debug and test your virtual worlds creations.



Melanie Lam

Melanie Lam is the Director of the Alice Project at CMU. She is a veteran producer and designer with numerous shipped titles on the Sims Franchise and Dreamworks movie games during her industry tenure. Moving into edtech, she designed a speech recognition reading app and provided engagement design consulting for Khan Academy. Melanie has been on the faculty of the Entertainment Technology Center and the Director of the National High School Game Academy, Carnegie Mellon's Summer Precollege Program. She is passionate about education equity and access, volunteering at Streetcode Academy and Current Silicon Valley towards that end. She holds a Bachelor of Communication Studies from Nanyang Technological University, Singapore and a Master of Entertainment Technology from CMU.

STOCK MARKET

Grades 3-5, October 26

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

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.

THE SCIENCE AND ENGINEERING OF FABRICS

Grades 7-9, November 9

Have you ever looked closely at the fabric that makes up your shirt, backpack, or bed sheets? If you do, you will see that they are made of tiny threads, but the patterns with which they interlock can be quite different in different types of fabric! In this workshop, we'll discuss different ways that fabrics can be created, and you'll have a chance to try out a few yourself!



Dr. Rachel Kurchin

In her professional capacity, Dr. Rachel Kurchin is a computational materials scientist at Carnegie Mellon University who studies materials for clean energy applications. In her spare time, she enjoys knitting, riding her bike, and playing with her cat Fred.



Saturday 2024 Series Classes

Each class is \$55*

Classes take place from 9:00 AM - Noon
on the Carnegie Mellon University Campus

*To apply for scholarship funds, please submit a copy of the first page of your IRS 1040 tax form from 2023.

September 21st

- Gr. K-2: BUG-BOTS
- Gr. 3-5: BUILDING BLOCKS OF 3D PRINTING
- Gr. 3-5: HOW ENGINEERS MAKE PLANES FLY
- Gr. 5-7: MATH TURNED INSIDE-OUT
- Gr. 6-8: BRAIN-BOTS
- Gr. 7-9: DIGITAL PHOTOGRAPHY

October 26th

- Gr. K-2: INTRODUCTION TO AERODYNAMICS
- Gr. 2-4: CODING FOR BEGINNERS
- Gr. 3-5: STOCK MARKET
- Gr. 4-6: HOW DOES THE BRAIN WORK?
- Gr. 5-8: PROGRAM USING ALICE VR
- Gr. 6-9: HOW TO SET HOMEWORK GOALS

November 9th

- Gr. K-2: LIQUID SCIENCE
- Gr. 3-5: COMPLEX FLUID TOYS
- Gr. 3-5: MARVELOUS MACROMOLECULES
- Gr. 4-6: NATURE'S ARCHITECTS: EVOLUTION AND ACTION
- Gr. 5-7: THE MICROBIAL WORLD AND HUMAN HEALTH
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