

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

All Gelfand Outreach Spring Saturday Series Classes are \$50 per class.

Scholarship funds are available through gifts from several Carnegie Mellon alumni. Please contact us to learn more.

HIGH SCHOOL DIVISION GRADES 9-12

DISEASE OUTBREAKS, GRADES 9-12

9am - noon, February 18th

High school students interested in biology, join us in a CMU Biology Lab. Class will take place in the Mellon Institute located on Bedford Avenue in Oakland. In this class, you will track a SIMULATED disease outbreak. You will perform an ELISA or enzyme linked immunosorbent assay to determine if you have been exposed to a contagious "disease". The ELISA uses antibodies to detect the presence of a disease agent, for example, viruses, bacteria or parasites in your blood or other bodily fluid. You will then track the disease back to its source. You will learn how an ELISA works, and learn about the field of Immunology. It is important to emphasize that this is a SIMULATED lab, that is, you are NOT working with any pathological agents that cause disease. Because you will be in an actual biology lab, students must wear closed-toed shoes and follow the safety rules in the lab. Lab coats, goggles and gloves will be provided.



Dr. Carrie Doonan is the Director of Undergraduate Laboratories and 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.

HOW ENZYMES WORK, GRADES 9-12

9am - noon, April 29th

You've heard about lactose intolerance, but have you ever wondered what is missing in the body to cause it? Actually, what is the "magic" ingredient in our body to help us digest food and to sustain life? This ingredient is called enzyme. Come and join us in this introductory course to explore enzymes, how enzymes work, what affect enzyme activities, and how we can use this knowledge to improve our daily life, fight disease, and even power our planet in the near future. The scientific principles introduced in this course will also be put into action in the hands-on activities. In these activities, you will experience the conversion of hydrogen peroxide (H_2O_2), a corrosive and harmful chemical, to oxygen (O_2) by catalase; the development of the brown color on an apple or potato when cut open by catecholase; and the disappearance of egg white in a test tube by pepsin. You will also learn the cutting edge experimental tools used to understand enzyme functions. Class will take place in the Mellon Institute located on Bellefield Avenue in Oakland. The students will be in an actual chemistry lab, and must wear closed-toed shoes and follow the safety rules in the lab. Lab coats and goggles will be provided.

Dr. Yisong Guo is an Assistant Professor in the Chemistry Department at Carnegie Mellon University (CMU). Dr. Guo received his B.S. in Material Science and Engineering from Fudan University in China, and Ph.D. in Applied Sciences from University of California-Davis. His research group at CMU is working on an interdisciplinary field where efforts from biochemists, synthetic chemists, physicists, and spectroscopists are joined together to understand the mechanisms of chemical transformations catalyzed by enzymes. The chemical principles discovered through his research will help improve the technologies needed to make the transition to a sustainable energy future and enrich scientific knowledge in fighting disease.



PRIMARY DIVISION GRADES K-2

BUG-BOTS, GRADES K-2

9am - noon, February 18th



Bounce your way into the exciting world of robots! Explore motion, power, electricity, and robots. 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 into the class at 11:45 for a Bug-Bot parade of all the class creations.

Christa Romanosky is a writer and educator. She has been working with the Gelfand Center for Service Learning and Outreach for over two years. She has a master's degree from the University of Virginia and a B.S. and B.A. from Carnegie Mellon University. She has taught classes for Gelfand Outreach and other workshops and K-12 courses for over nine years, creating engaging and fun curriculum for all learners.

BUILDINGS, TOWERS AND BRIDGES: OH MY! GRADES K-2

9am - noon, January 28th

How do buildings stay standing? Structures vary in strength when they are made out of different materials and shaped differently. In teams, students will create towers and bridges to see whose is the strongest. Can you make a structure out of paper that stands up? Can you create an arch that supports your own weight? Join us to find out!

Samantha Weaver is the director of CMU's Architecture Explorations outreach program and has expanded program offerings and tied lesson plans directly to current architecture trends and the expertise of local Pittsburgh architects. Samantha's goal is to provide an architectural foundation for children and youth; fostering appreciation of the built environment, encouraging creative expression and critical thought, and inspiring civic responsibility. In class, Samantha will guide students through the architecture design process as they research native Pittsburgh plants and use organic geometry to create towering structures. Samantha graduated from CMU's School of Architecture in 2011, with a Bachelor of Architecture and a focus on sustainable design, participatory design, and K-12 education. During her education, Samantha completed a thesis designing adaptable learning corridors in schools and taught summer camps at the Carnegie Museum of Art.



BUILD YOUR IDEAL HOME GRADES K-2

9am - noon, April 29th

How do buildings stay standing? Structures vary in strength when they are made out of different materials and shaped differently. In teams, students will create towers and bridges to see whose is the strongest. Can you make a structure out of paper that stands up? Can you create an arch that supports your own weight? Join us to find out!

Samantha Weaver is the instructor of this course. Please see her biography above.

INSECT DWELLINGS, GRADES K-2

9am - noon, March 25th

Ever wonder where insects live? Is it on a leaf, in a hive, or perhaps in an underground tunnel? In this introductory architecture class you will discover how insects of all kinds live. Explore the structure and habitat which they live within.

You will be able to select an insect from ants, to ladybugs, or even butterflies and then design a home for your small friend to live!



Elizabeth Levy is currently a second year student in Carnegie Mellon University's School of Architecture. She has taught children K through 7th at the Anvil Art Studio, Camp Invention Program, Phipps Conservatory Discovery Center, and presented Sustainable Living Research to several class rooms of students in Pennsylvania. She has a background in art, design, and horticulture with interests in Biology, Sustainability, and Education. As a member of CMU's Architectural Outreach Program, Elizabeth's focus is to instill in children the importance of S.T.E.A.M. ideals and introduce architecture at a young age.

MISBEHAVING MACHINES, GRADES 2-3

9am - noon, March 25th

When machines go wrong, what can we do? What discoveries have we made from failure? Learn about the best failed machines and unanticipated inventions of all time, and what great creations came from the results of failure. Take an everyday machine and explore its potential. Engineer your own inventions by creating, redesigning, transforming, and disrupting machines!

Christa Romanosky is the instructor for this class. Please see her biography above.

WRITE-ON SCIENCE, GRADES 2-3

9am - noon, January 28th

Discover Bioluminescence, Light Emitting Diodes (LEDs) and Poetry! Everyone loves fireflies that light up at night, but did you know lots of different animals glow and light up, including fish, mollusks, bacteria, and mushrooms? Learn how these animals and fungi use their lights for good and for hunger! And they're not the only ones who benefit from bodies that light-up. Discover how scientists are using bioluminescence to help solve problems in our world. Bioluminescent trees instead of street lights? Glow-in-the-dark exit signs? It could happen! Adventure into uncharted territory as you create your own bioluminescent creature using LEDs and solar pigment, and write on science in the form of an ode poem to your favorite glowing creature.

Christa Romanosky is the instructor for this class. Please see her biography on the previous page.

MIDDLE DIVISION GRADES 3-8

ARCHITECTURE OF SOUND, GRADES 3-5

9am - noon, February 18th

Have you ever noticed different places where your voice echoes, or places where the sound is very hushed? Learn about the science of acoustics, and how sound can change depending on how a room is shaped or what materials were used to make the room. Design your own models ranging in scale from mini concert halls to big sound machines!

Kelly Li is a student at Carnegie Mellon University currently studying architecture with an interest in design and education. She has previous experience teaching kids aged five through thirteen at Carnegie Mellon's School of Architecture Saturday Sequence, Carnegie Museum of Art, Summer Dreamers Academy at Faison, and Hunakai Studio of Fine Arts. Her goals include teaching others about how the creative design process can begin to positively influence the environments around us.



CAMERA ENGINEERING, GRADES 5-7

9am - noon, January 28th

Building your own camera is not just fun, but good engineering practice. The workshop will be comprised of short lectures on four topics: history of imaging, basics of optics and photography, power-generation and storage, and operating principles behind a modern digital camera. Students will then build their own camera and, weather permitting, will go for a hike to use their newly built cameras to take photographs. Tips will be provided to help them explore unusual framing concepts and achieving artistic effects.



Dr. Aswin Sankaranarayanan is an Assistant Professor at Carnegie Mellon University (CMU). He earned his Ph.D. from University of Maryland, College Park where he was awarded the distinguished dissertation fellowship for his thesis work by the ECE department in 2009. Aswin is currently the PI of the Image Science Lab at CMU (<http://imagesci.ece.cmu.edu>), whose research consists of a diverse portfolio, ranging in topics from optics, computer vision, and image processing. He has received best paper awards at the CVPR Workshop on Computational Cameras and Displays (2015) and Analysis and Modeling of Faces and Gestures (2010). He has given a keynote talk at the IEEE Computational Cameras and Displays Workshop (2015), as well as invited talks at a number of conferences.

ENERGY FROM EVERYDAY THINGS, GRADES 5-7

9am - noon, March 25th

Many of the things we use every day can be used to help generate clean energy. Did you know that you can trap sunlight and generate energy from blackberry juice? Did you know that you can run a car on water? No? Then come and experience two amazing projects designed in the laboratory of Carnegie Mellon University Professor Reeya Jayan. Maybe, what you have for a snack while reading this paragraph can help power our future?

B. Reeya Jayan is an Assistant Professor in Mechanical Engineering at Carnegie Mellon University (CMU). She also holds a courtesy appointment in the Materials Science and Engineering department at CMU. Prof. Jayan received her M.S. in Electrical Engineering and Ph.D. in Materials Science and Engineering from The University of Texas at Austin (UT-Austin), working with Professor Arumugam Manthiram. She was subsequently a Postdoctoral Associate in Chemical Engineering at the Massachusetts Institute of Technology (MIT), working under the supervision of Professor Karen Gleason. Her multidisciplinary research group at CMU explores novel design strategies for organic (polymers, small molecules), inorganic (metals, semiconductors, insulators), and organic-inorganic hybrid materials for applications in energy and sustainability. Her work has resulted in 18 peer-reviewed journal publications and filing of 4 patent applications. She is a recipient of the Cockrell School of Engineering Student Leadership Award from UT-Austin, a doctoral fellowship from the American Association of University Women (AAUW), and the H.H. The Maharaja of Cochin Endowment Prize from the University of Kerala, India.



ENGINEERING 101, GRADES 5-7

9am - noon, April 29th

What is engineering and how do engineers design new systems and products? Engineering marvels are all around us, and are essential parts of our everyday lives. In this class we will explore the engineering design process and how engineers overcome challenges of mechanics, environment, and change. Students will face an engineering challenge, design and test a solution, and more importantly “redesign” to improve on the original idea. Students will see how fundamentals of math and science are used in the engineering design process as well.

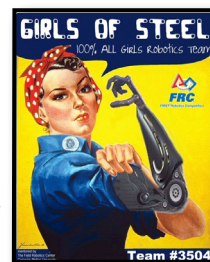


Dr. Deanna H. Matthews is Associate Department Head for Undergraduate Affairs and Assistant Teaching Professor in Engineering and Public Policy (EPP), and Education Director and researcher in the Green Design Institute (GDI) at Carnegie Mellon University. In her role in EPP, Dr. Matthews oversees the undergraduate programs. In the GDI, an interdisciplinary research center that focuses on the intersection of environmental and economic issues, her research centers on the development and deployment of the Economic Input-Output Life Cycle Assessment tool, examining energy life cycles of new products, corporate environmental management, and educating general populations about energy-environment issues. As Education Director, she oversees education and outreach initiatives for the GDI. She is the coordinator and instructor of outreach programs to K-12 students and teachers in school settings and informal educational events. She received her B.S.E. in Civil Engineering from Duke University (1994) and her M.S. (1995) and Ph.D. (2001) in Civil and Environmental Engineering from CMU.

INTRODUCTION TO MOBILE ROBOTICS, (GIRL'S ONLY) GRADES 6-8 9am - noon, March 25th

This course will be conducted by members of the Girls of Steel FIRST Robotics Team, an all-girls robotics team mentored at Carnegie Mellon's Field Robotics Center. Learn about the basic tools, electronics, and materials used to build a robot chassis similar to those used for the FIRST(r) FRC level robotics competition (www.USFIRST.org). Assemble a 6-wheel drop center chassis and learn to drive it. All girls in grades 6-8 are welcome to join this class!

Girls of Steel is an award-winning all-girl sixth-year FIRST® robotics(FRC) team based at Carnegie Mellon University's Field Robotics Center. Team members are students in grades 8 (junior members) through 12 from 30+ different schools around Pittsburgh and four different educational options including traditional public, private, cyber charter and home school. Girls of Steel competed in their first FIRST robotics competitions in the spring of 2011. The Girls of Steel – more than just a robotics team – has a mission “To find success in the empowerment of girls through well-developed skills in STEM.” The team has offered “Introduction to Mobile Robotics” multiple times – at outreach events such as Carnegie Science Center’s “Girls Rock Science” and at other workshops at Carnegie Mellon and at CalU’s Center for Innovation. presentation at schools and K-12 STEM related events in the area.



LIVE SMART, THINK SMALL, GRADES 6-8

9am - noon, March 25th

Have you been building things for as long as you can remember? Learn about civil engineering and architecture as we talk about ‘tiny houses.’ You will build a model of a ‘tiny house’ and in small groups, you will assemble the ‘tiny houses’ to make a condominium. Using math, we will talk about how the size of the rooms in a tiny house compares to your own home and how a condominium helps to conserve land. You will take your model home and be able to use it as a pencil box or a night light.



Dr. Deborah Lange is an environmental engineer that has worked in academia as well as in small and large businesses. Currently, she is the Director of Special Environmental Project for the Steinbrenner Institute at Carnegie Mellon, where she has been for the last 17 years. She is a graduate of The Pennsylvania State University (BS, Civil Engineering) and Carnegie Mellon (MS and PhD, Civil and Environmental Engineering.) Deb is active in the Pittsburgh community as a Director of the Allegheny County Conservation District and is a past president of the Engineers’ Society of Western Pennsylvania. She also enjoys ‘STEM’ outreach and is working with Propel Charter high schools as well as the Sarah Heinz House Boys and Girls club. Deb has 3 adult children: a medical doctor, an architect, and an environmental engineer. She enjoys tinkering at TechShop and international travel with her husband, including motorcycling adventures in Europe & in Cuba.

MARVELOUS MOLECULES, GRADES 4-6

9am - noon, January 28th

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 every day. In this workshop students will learn about a variety of polymers and their application across the world. They will also explore various methods of making these polymers. This hands-on workshop will have students working in the lab and participating in lecture demonstrations to explore the amazing world of polymer chemistry. Students must also wear close-toed shoes to class. We will be working in a CMU chemistry lab and required to wear a lab apron and safety goggles provided for additional safety precautions.

Dr. Gizelle A. Sherwood is currently an Assistant teaching Professor at Carnegie Mellon University. She earned her Ph.D in 2008 where her research focused on the effects of aggregation on the photophysics of oligomers related to MEH-PPV and CN-PPV. She primarily lectures Quantitative Chemical Analysis laboratories to the sophomore chemical engineers, biology and pre-med student. She is also involved in several outreach programs working with both the Boy Scouts of America and the Leonard Gelfand Center.



MECHANICAL ROBOT GRIPPERS, GRADES 5-8

9am - noon, April 29th



The field of Robotics is a combination of mechanical engineering, computer science, and electrical engineering. This hands-on workshop will give students a taste of the mechanical side of robotics. Students will be able to interact with CMU's very own robot called the Multipurpose Mobile Manipulator (MMM). In small groups, students will design a gripper for the robot out of Legos, and then test out their design by controlling the robot to see how well it performs specific tasks.

Hannah Loy is a sophomore at Carnegie Mellon University's College of Engineering, studying Mechanical Engineering with an Additional Major in Robotics. She works as a Physics tutor for Academic Development, and travelled to the Dominican Republic last year as a volunteer to teach students English. Her goal is to excite young students about the endless possibilities of science, and to promote STEM at a young age.environments around us.

RESPONSIVE ARCHITECTURE, GRADES 3-5

9am - noon, April 29th

Have you ever seen buildings move? There are many reasons why we make architecture that can move, such as changing needs of humans or generating energy. Learn about how we use technology to make the buildings we live in smarter and greener. You will get to design solutions and test how they work using sensors and lights. Will you be able to design architecture as smart as you?

Gargi Lagvankar is a third year student at Carnegie Mellon University's School of Architecture with interests in art, ecology and education. Her previous experience includes working with Assemble and working as a tutor for English and Math for children from ages 10-17. She aims to make STEAM ideas accessible to more children and instill the importance of creativity and the natural environment from a young age.



ROBOTIC BOATS, GRADES 4-5

9am - noon, February 18th

Build robot boats! Deploy them and learn how teams of such robots are being applied in the real world to monitor water quality. Students will learn about electromotive forces, how motors work, robot controls and create robotic boats towards an application that they desire. We will also talk about how to make robots that are curious about their environment, so that they can be used to collect data. The basic principles of robot controls, information theory and the boat kit accrued during this workshop will enable you towards implementing your own innovative data gathering robots.



Sankalp Arora is a 3rd year PhD student at CMU,RI. He completed his Masters in Robotics at RI in 2014 and worked as Research Engineer from 2010-2012 here. During his stay here he has developed planning and perception algorithms for flying vehicles. He worked on safety and sensor planning for AACUS, world's first guaranteed safe full scale autonomous helicopter, world's first climate invariant infrastructure free ship-deck tracker. And is currently a recipient of Qualcomm Innovation fellowship for the development of autonomous curious Unmanned Aerial Vehicles for data gathering.

SOLAR ENERGY, GRADES 4-6

9am - noon, January 28th

You've heard that the sun can provide enough energy to power the whole world, but how is that energy harnessed? Why isn't this powerful, renewable, clean energy source used more often? Learn the basics of heat and how solar energy is used today, how a solar furnace can be used to heat your house in the winter and build your own solar hot water heater to take home with you to share. Solar energy, it's hot!

Kristin Lavery has been the Assistant Director of the Leonard Gelfand Center (LGC) for Service Learning and Outreach since January of 2013. She joined the LGC after completing her Master of Arts in Teaching (grades K-6) at Chatham University in December of 2012. Kristin coordinates tutoring programs in the local Pittsburgh area where CMU students act as after school tutors, or teaching assistant and mentors in classrooms. Kristin also develops activities and workshops for presentation at schools and K-12 STEM related events in the area.



STOCK MARKET, GRADES 4-6

9am - noon, April 29th

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!



Jeffrey Looby is a second year master's student and Head of Tepper School of Business Graduate Finance Association. Prior to entering business school, Mr. Looby earned a Bachelors of Art degree in Business Economics with a minor in Accounting from the University of California, Los Angeles. After earning his degree, Mr. Looby successfully passed the CPA exam and frequently volunteered with Junior Achievement in both Los Angeles and Dallas. In all, Mr. Looby has more than four years of finance experience helping companies and their advisors with their complex accounting and finance problems and objectives. Assistants for this workshop include, David Dieker second year master's student and Head of Tepper School of Business Data Analytics Club, Kelly Pasekoff and Alberto Chan students in the Tepper School.

USE YOUR NOGGIN:LEARN THE BRAIN GRADES 6-8

9am - noon, February 18th

Come explore your brain and senses. In this workshop you will have the opportunity to learn about the electrical and chemical signals that drive your brain to see, hear, feel and think. We will have hands-on demonstrations allowing you to explore your amazing brain in action and see some surprising ways in which your senses get things right and other ways that your senses can be fooled. We will also get to look inside a brain by seeing a pre-dissected real sheep's brain so you can see the ways that your brain is similar to and different from another animal's brain in its structure.

Dr. DJ Brasier is an Assistant Teaching Professor of Biological Sciences specializing in neurobiology. He was trained in brain physiology and genetics at University of California San Diego and UC San Francisco. He has been teaching neuroscience at CMU since 2012 and involved in community outreach for many years.



Gelfand Outreach Spring 2017 Saturday Series Classes.

Classes are \$50.00 each and are conducted from 9am to noon at Carnegie Mellon University.*

January 28th

Buildings, Towers and Bridges: Oh My!, Gr. K-2
Write-On Science, Gr. 2-3
Marvelous Molecules, Gr. 4-6
Solar Energy, Gr. 4-6
Camera Engineering, Gr. 5-7

March 25th

Insect Dwellings, Gr. K-2
Misbehaving Machines, Gr. 2-3
Energy from Everyday Things, Gr. 5-7
Live Smart, Think Small, Gr. 6-8
Intro to Mobile Robotics, Girl's Only, Gr. 6-8

February 18th

Bug-bots, Gr. K-2
Architecture of Sound, Gr. 3-5
Robotic Boats, Gr. 4-5
Use Your Noggin: Learn the Brain, Gr. 6-8
Disease Outbreaks, Gr. 9-12

April 29th

Build Your Ideal Home, Gr. K-2
Responsive Architecture, Gr. 3-5
Stock Market, Gr. 4-6
Engineering 101, Gr. 5-7
Mechanical Robot Grippers, Gr. 5-8
How Enzymes Work, Gr. 9-12

**Please contact us for information about scholarship options.*

5000 Forbes Avenue, Wean Hall 4612, Pittsburgh, PA 15213 - 412-268-1863

<http://www.cmu.edu/gelfand> - GelfandCenter@andrew.cmu.edu