

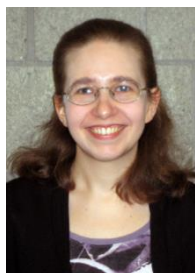
Rigorous ~ Educational ~ STEM Focused ~ Hands-on ~ Fun!

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

Primary Division Grades K-2

BASIC MACHINES, Grades K-2

9am- noon, February 20



Do you enjoy building things? Would you like to build a motorized simple machine? You will work with a partner and the LEGO® Motorized Machine kit to build machines that move in different ways. The machine you will make will help you to understand how things work. Motions, forces, transfer of energy and the principles of basic machines will be studied through hands-on activities with the LEGO® models.

Dorothy Holland-Minkley is the Academic Support Coordinator for the Department of Physics and STEM Initiatives. She received a B.S. in Physics and B.A. in Japanese from Carnegie Mellon University in 2008 and went on to investigate cultural influences on robotics research, earning an M.A. in East Asian Studies from the University of Pittsburgh in 2010. She spent several years teaching physics at Cornell University, and has recently returned to Carnegie Mellon to help implement the new Mellon College of Science core curriculum and advise new students on their academic pursuits and research opportunities in physics.

BUG-BOTS, Grades 1-2

9am- noon, January 23 and April 23

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 the high school poetry instructor at Pittsburgh CAPA, and has been working with the Gelfand Center for Service Learning and Outreach for over a year. Christa's lessons focus on cultivating a strong interest for poetry and creative writing in k-12 students by pairing appealing, age-appropriate topics with lessons about craft and writing. She has a Master's of Fine Arts from the University of Virginia, and is a graduate of Carnegie Mellon University.



INSECT DWELLINGS, K-2

9am- noon, March 19



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 classrooms 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.

MORE BASIC MACHINES, Grades K-2

9am- noon, March 19

Still can't get enough of building things? Would you like to build more motorized basic machines? You will work with a partner and the LEGO® Motorized Machine kit to explore more complex machines while investigating the physics behind them. Get your motors started as you explore pulleys and gears! Students may take one or both of the machine classes as topics will be different for each class.

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MY IDEAL HOUSE, Grades K-1

9am- noon, February 20

Factors such as time and location play a role in shaping the look and feel of a home. What shapes can we find in local Pittsburgh houses? Can we use these shapes and forms to inspire our own dream house designs? Learn how to create drawings and models of buildings to make your own unique architectural language and house design. Recycled materials, such as cereal boxes, will be used so students are inspired to use items in their own home to make architectural creations!



Samantha Carter 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 Building Up!, 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 Carnegie Mellon University'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.

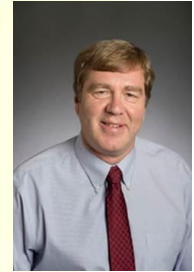
Upper Division Grades 3-9

ADDITIVE MANUFACTURING, Grades 6-8

9am- noon, January 23

Engineers create many of the products that you see and hear about every day, often using computers to draw, analyze, re-design, and manufacture these products. This introduction to additive manufacturing (AM) includes a brief history of AM processing, a discussion of and technical fundamentals of current AM processes including additive fabrication of parts on Cube Pro maker machines, subtractive fabrication of parts via laser cutting and an introduction to direct metal additive manufacturing used in the aerospace and other industries. The students will also tour the Carnegie Mellon Mechanical Engineering Lab.

Dr. Beuth's research interests are in the area of solid mechanics and manufacturing. Much of his research relates to his expertise in the areas of thermomechanical modeling of manufacturing processes, fracture mechanics, and the mechanics of coatings and layered materials. His current research includes work in three areas. One area being investigated relates to Mechanics of Electron and Laser Beam-Based Additive Manufacturing Processes, which are automated processes for directly building 3-D parts or features, layer-by-layer, via electron beam- or laser-based deposition. These processes are also referred to as direct digital manufacturing or solid freeform fabrication and offer an alternative means for fabricating metal parts for the aerospace and medical implant industries.



BUILDING UP! Grades 3-5

9am-noon, January 23

From concept sketch to building, skyscrapers must be designed with geometry and physics in mind. Learn the math, science, and design behind skyscrapers. Work as a team and work individually to add to Pittsburgh's skyline. How can a new skyscraper be inspired by geometry found in native Pittsburgh plants?

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CAMERA ENGINEERING, Grades 5-7

9am- noon, April 23

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. He earned his Ph.D. from University of Maryland, College Park where he was awarded the 2009 distinguished dissertation fellowship for his thesis work by the ECE department. Aswin is 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, January 23

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 and also holds a courtesy appointment in the CMU Materials Science and Engineering department. Prof. Jayan earned 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, February 20

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 and her M.S. and Ph.D. in Civil and Environmental Engineering from Carnegie Mellon University.



INTRODUCTION TO MOBILE ROBOTICS, Grades 7-9

9am- noon, March 19

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.



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 CalU’s Center for Innovation.

IT'S A MATERIAL WORLD, Grades 5-7

9am- noon, February 20

What is materials science? Materials science is the study of "stuff." Materials are everywhere -- from your clothing to your computer to the appliances in your home. Explore the world of materials by learning about how scientists use the properties of materials to engineer products we use every day. Students will explore the different categories of materials, learn about the basic building blocks and experiment with new materials with hands on demonstrations.

Dr. Neetha Khan is the director of the MS program in Materials Science and Engineering. She teaches a course focusing on developing professional skills for graduate students. Dr. Khan has a PhD in Materials Science from the University of Delaware and a B.A. in Chemistry from Franklin and Marshall College. She has been working at Carnegie Mellon University, developing materials science curriculum with k-12 teachers for the past 6 years.



IT'S IN YOUR DNA! Grades 3-5

9am- noon, January 23 and March 19

Have you ever wondered why your hair is brown or why your friend's eyes are green? It's in your DNA! In this course, students will be introduced to the importance of DNA and its heredity function. They'll explore the structure of this double-stranded molecule through a hands-on building activity. Did you know that even some of your favorite foods have DNA? Students will examine the DNA of fruits such as strawberries and bananas. They will explore how scientists can use basic information about DNA to create new medical advancements.



Melinda Sager has been a research technician in Dr. Patricia Opresko's Lab at the University of Pittsburgh since May of 2014. She's also a member of CNASt at CMU. Her research focuses on DNA damage and repair at telomeres in the presence of genotoxic agents. Melinda received her Bachelors of Science in Biology degree from La Roche College in 2014 and also has an Associate of Arts in Early Child Development from BCCC.

LIVE SMART, THINK SMALL, Grades 6-8

9am- noon, January 23

Have you been building things for as long as you can remember? Learn about civil engineering, architecture and sustainability as we talk about 'tiny houses.' You will build a model of a 'tiny house' and using math you will compare the size of the rooms in the tiny house to the size of the rooms in your own home. We will also discuss how a tiny house is sustainable - from material usage, to energy efficiency, to reducing the accumulation of 'stuff.' 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 and in Cuba.



PUZZLES, GAMES AND PROBLEM SOLVING, Grades 7-9

9am- noon, April 23

Explore critical thinking and problem solving via Puzzle-based Learning. While solving puzzles is innately fun, companies such as Google and Yahoo also use puzzles to assess the creative problem solving skills of potential employees. The ultimate goal of Puzzle-based Learning is to lay this foundation to become effective problem solvers in the real world. In this interactive and fun workshop we will brainstorm and discuss a range of puzzles, brainteasers, and games. Come and experience moments of puzzlement morph into moments of, Aha insight!



Dr. Raja Sooriamurthi is a Teaching Professor of Information Systems in the Dietrich College of Humanities and Social Sciences at Carnegie Mellon University. According to Dr. Sooriamurthi, solving puzzles is more than just fun. It's a great way to boost out-of-the-box thinking and creative problem solving. In addition to his work in the US, he has offered a range of popular courses and workshops on PBL in Australia, Qatar, UAE, Kazakhstan, and India. Along with colleagues, he recently published the book Guide to Teaching Puzzle-based Learning (Springer, 2014) to help other educators utilize this approach. Dr. Sooriamurthi's is a passionate teacher whose pedagogical efforts have been recognized with several awards for distinguished teaching.

SUPER HEROES & VILLAINS:

9am- noon, February 20

Write and Create Characters and Their Worlds! Grades 3-4

Have you ever thought about what kinds of superheroes you WISH existed? Or what types of superpowers you wish you had? Fly, teleport, and rappel into this creative writing class and craft your own unique superhero and the world they are battling to save. We'll work on everything from naming and designing your hero, to creating rules for the world in which they live. You may even want to create a villain instead! Create a short story and use dialogue to share with family and friends. Parents are invited into the class from 11:45-noon to hear about each student's hero.

Christa Romanosky is the high school poetry instructor at Pittsburgh CAPA, and has been working with the Gelfand Center for Service Learning and Outreach for over a year. Christa's lessons focus on cultivating a strong interest for poetry and creative writing in k-12 students by pairing appealing, age-appropriate topics with lessons about craft and writing. She has a Master's of Fine Arts from the University of Virginia, and is a graduate of Carnegie Mellon University.



WEARABLE COMPUTERS, Grades 7-9

9am- noon, March 19

Bracelets that buzz, scarves that sense, ties that talk, blouses that blink— it's all part of wearable engineering! Students will learn about the rapidly developing field of wearable technology, and will design their own conductive fabrics and simple-to-program electronics.



They'll also learn how humans and computers interact to form wearable technology, also known as "soft robotics". This class will inform and excite students about this electrifying subfield of mechanical engineering in our constantly upgrading world.

Dr. Majidi is an Assistant Professor of Mechanical Engineering at Carnegie Mellon University starting September 2011. Prior to joining the faculty, he was a postdoctoral fellow in the Harvard Microrobotics Laboratory (2009-2011) and the Princeton Institute for the Science and Technology of Materials (2007-2009). His experience in solid mechanics and microfabrication is the foundation of his current research in the emerging fields of soft robotics and active multifunctional materials.

WHY THINGS FALL DOWN, Grades 3-5

9am- noon, April 23

We see all the buildings around us that stand up; what about the ones that fall down? Why do they fall down? Explore how extreme weather and climate can influence buildings around the world, and learn about the forces that make them stand. Design a building that can survive a hurricane, a wildfire, or an earthquake!

Kelly Li is a student at Carnegie Mellon University currently studying architecture with an interest in design and education. She has previous experience teaching children 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.



Gelfand Outreach Spring 2016 Saturday Series Classes.

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

January 23rd

Bug-bots, Gr. 1-2
Building Up! Gr. 3-5
It's in Your DNA! Gr. 3-5
Energy of Everyday Things, Gr. 5-7
Live Smart, Think Small, Gr. 6-8
Additive Manufacturing, Gr. 6-8

March 19th

Insect Dwellings, Gr. K-2
More Basic Machines, Gr. K-2
It's in Your DNA! Gr. 3-5
Intro to Mobile Robotics, Gr. 7-9
Wearable Computers, Gr. 7-9

February 20th

My Ideal House, Gr. K-1
Basic Machines, Gr. K-2
Super Heroes & Villains, Gr. 3-4
Engineering 101, Gr. 5-7
It's a Material World, Gr. 5-7

April 23rd

Bug-bots, Gr. 1-2
Why Things Fall Down, Gr. 3-5
Camera Engineering, Gr. 5-7
Puzzles, Games & Problem Solving, Gr. 7-9

