

# GELFAND OUTREACH

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

Summer 2020 Series Classes - Carnegie Mellon University

*Scholarship funds are available through gifts from several Carnegie Mellon alumni. Please see the information below learn more.*

## Program Overview

The Gelfand Outreach Summer Program is designed to illuminate, encourage, and motivate our future scholars through week-long classes in science, technology, engineering, math, and arts. We value hands-on learning, creating, collaborating and sharing ideas. We understand the importance of providing opportunities for our young learners in Pittsburgh and surrounding communities. Our Summer Series enables local students to explore science, engage in experiments using the scientific method, build prototypes, and so much more.

## Instructors

We partner with members of the Carnegie Mellon University community to present these exciting summer courses for K-12 students. CMU faculty and staff design our Gelfand Outreach classes to spark learning and enthusiasm in the fields of science, technology, engineering, math, and arts. We introduce young learners to their cutting-edge discoveries in research at CMU. Gelfand Outreach teachers are scientists and educators who understand the significance of early STEM education for our youth. For more information about each instructor see the brief biography following the course description.

## Application Process

Classes are open to students in grades K-12. Parents register online and students are assigned to classes in the order in which we receive the registrations. Students may take one or more classes.

## Location

Classes are held on Carnegie Mellon University's campus in the Oakland neighborhood in Pittsburgh, PA.

## Daily Schedule

9 am - Noon or 9 am - 4 pm weekdays (See the schedule on page 7 for details.)

On Friday, the last day of the program, we invite parents and siblings to attend the class for a presentation. Class will meet at the usual beginning time but will stop early for the presentation. You will have a chance to tour your child's classroom, visit informally with teaching staff, and meet other Gelfand Outreach parents.

## GO After Class Care - Full Day Option

After Care is an extended day alternative for students attending a morning GO class at Carnegie Mellon University. Students will participate in recreational activities such as sports, hikes/trails/tours, board games, card games, Frisbee and other outdoor/indoor events. Students should bring a nut-free, brown bag lunch and their own water bottle. This care is provided from noon to 4:00 p.m. on Monday-Thursday of the GO morning class.

## Cost

Classes are \$325, 9 am-noon daily, unless otherwise noted. The cost of the optional Monday - Thursday After Class Care program is \$80. All fees must be prepaid. Payment is expected when a child is accepted to guarantee their spot in class.

## Financial Aid

Scholarships are limited to one class per child. To qualify you must submit a copy of the first page of your IRS Tax Form 1040 from the past year. We are able to award scholarships through a gift provided by Carnegie Mellon alumnus Bernard Meisner and other donors to support students in Gelfand Outreach classes.



Carol Smith

## ALL STEAM AHEAD GRADES K-2

July 13<sup>th</sup> - 17<sup>th</sup>

All aboard! Create, discover, and learn with Science, Technology, Engineering, Arts, and Math. In this course, students will be sampling the different parts of STEAM, making connections between the things around us and how they work. Explore the different states of matter, gravity, sound waves, and more! Use science, technology, engineering, arts, and math to make predictions, design and run experiments, and make conclusions that help us to understand our world.

**Carol Anne Smith** is a classroom teacher at Paint and Play School, a private academic prekindergarten school located in DuBois PA. She holds a B.S. in Early Childhood Education and active PA teaching certification. She is also the executive director of Paint and Play School, Inc. and serves as co-chairperson of its board of directors. Carol is a mentor to student teachers and interns from Clarion University of PA and Penn State University. She is an instructor for Penn State DuBois Kids in College Program. She served as the Coordinator of Clearfield County Society for Handicapped and Disabled Citizens Interactive Play Program in Clearfield and DuBois. During her career she has been involved with many summer youth programs including CMU's Children's School and this is her second year as an instructor for the Gelfand Center.



Dr. Terry Richards

## ANATOMY & ROBOTICS GRADES 5-7

June 15<sup>th</sup> - 19<sup>th</sup>

This class is for the aspiring physician, scientist or roboticist! Learn the anatomical concepts of the bones and muscles that make up the human arm. Dissect a chicken wing to see the components and how it functions. Discuss extension and flexion of the arm and how the elbow and wrist move. Diagram the muscles and bones and make life-sized models. Program a circuit board and make your arm model come to life. Use servos, LEDs, and sensors as you apply robotic technology to make your anatomical model move in a very realistic way. When science meets technology, you will be amazed -- we're not twisting your arm!

**Dr. Terry Richards** has been a mentor for the Girls of Steel Robotics program since 2010, and since 2012 she has been a member of the staff of the Robotics Institute at Carnegie Mellon University (CMU). Leading the Girls of Steel FIRST LEGO® League (FLL) program, she offers summer camp and team experiences where high school girls mentor middle school boys and girls in all aspects of FLL skills – research, robot, and core values. In 2015 and 2017 Terry received National Center for Women & Information Technology (NCWIT) Educator Awards. Terry has a B.S. in Chemistry (Simmons College) and a Ph.D. in Biological Sciences/Biochemistry (CMU).



Students participate in various hands-on learning activities to learn more about science!



Dr. Aswin  
Sankaranarayanan



Dr. Ioannis  
Gkioulekas

## FROM PHOTONS TO PHOTOS GRADES 9-12

June 22<sup>nd</sup> - 26<sup>th</sup>

Light and its interactions with the world around us is a fascinating topic at the center of many scientific disciplines. This five-day workshop is an introduction to the physics of light, with a focus on topics relating to imaging and displays. We will begin by investigating properties of light such as spectrum, polarization, and coherence, and see how they provide complementary insights into the world around us. We will use this background to understand how cameras work, and how images are formed. We will then study specialized cameras that are used in scientific applications, including microscopy, astronomy, and 3D scanning. Additionally, we will look at how manipulating light can help us build not only special cameras, but also new types of displays for 3D viewing and virtual reality. Finally, we will use off-the-shelf optical components to build simplified versions of a few of the cameras and displays presented. The workshop will include lab visits and demos at various imaging labs at Carnegie Mellon University. This class is supported by an NSF Grant.

**COST: \$50**



Dr. Srinivasa  
Narasimhan



Dr. Matt  
O' Toole

Class instructors are faculty at Carnegie Mellon: **Aswin Sankaranarayanan**, Associate Professor, Electrical & Computer Engineering, **Ioannis Gkioulekas**, Assistant Professor, Robotics Institute, **Srinivasa Narasimhan**, Professor, Robotics Institute and **Matt O' Toole**, Assistant Professor, Robotics Institute.



Jasio Santillan

## INTRODUCTION TO MATERIALS SCIENCE GRADES 5-7

July 6<sup>th</sup> - 10<sup>th</sup>

The focus of this class is on relating material properties to superpowers and uses existing superheroes to illustrate the concepts. Included are an introduction to chemistry (compounds, the Periodic Table, and types of bonding) and how structure can give a material its unique properties. Students will learn how to make their own "bullet-proof" putty, and experiment making circuits with different types of materials. They will use shape-changing polymers and observe how a material's microstructure can influence its sound. Students will also be able to critically think and discover the answers to why Spider-Man can stick to walls, how Wolverine can heal his wounds, how Aquaman can control water, and more.

**Jasio Santillan** recently completed his M.S. degree in Materials Science and Engineering here at Carnegie Mellon University after previously getting his B.S. in Materials Science and Engineering with an additional major in Biomedical Engineering from CMU. His experiences include developing snake robots, artificial lung devices, drug delivering nanoparticles, and even synthetic fiber-composite marimba keys. His more recent research focuses on studying human interactions with shape-changing materials.



Christa Romanosky

## JUNK BOTS GRADES K-2

June 22<sup>nd</sup> - 26<sup>th</sup>

What are robots and what makes robots work? Can robots really take over the world? In this class, we'll build different types of robots and learn about batteries, LED, circuits, electricity, and more. We'll explore how engineers build machines and make modifications to our robots to really make them buzz, rattle, and move! Draw and design your own junk bot, bringing it to life with household items! Have fun with science and technology while learning to think like a robotics engineer. The sky's the limit!

**Christa Romanosky** is a current Tulsa Artist Fellow. She has had previous fellowships with the Provincetown Fine Arts Work Center and James Merrill House, with much of her writing integrating science and health-related topics. Romanosky holds an MFA from the University of Virginia, and bachelor's degrees in psychology and creative writing from Carnegie Mellon University. She has been teaching STEM classes through Gelfand Outreach since 2014 and has been an educator in the arts for over eleven years.





Jennifer Lang

## KITCHEN CHEMISTRY GRADES K-2

July 6<sup>th</sup> - 10<sup>th</sup>

Join your fellow scientists as we use everyday ingredients to conduct experiments and learn the science explaining them. Learn about solids and liquids by making your own glop! Learn how to blow up a balloon without using your own breath! Discover how to make a rainbow in milk. Discuss molecules and make your very own molecule model.

**Jennifer Lang** has taught several Gelfand Outreach courses over the past few years at CMU and has taught Science and Special Education at Kiski Area School District for the last five years. Prior to that Jennifer taught Chemistry at Vincentian Academy and Mount Alvernia High School for 10 years. She attended Saint Vincent College and has a BS in Chemistry and a MS in Environmental Education. Jennifer also has a MS in Special Education from Slippery Rock University.



Dr. B. Reeja Jayan

## LEARN ENGINEERING @CMU THROUGH MINECRAFT GRADES 4-7

July 20<sup>th</sup> - 10am-4pm (NOTE: This is a 1-day, 5-hour workshop, with a 1-hour supervised lunch break.)

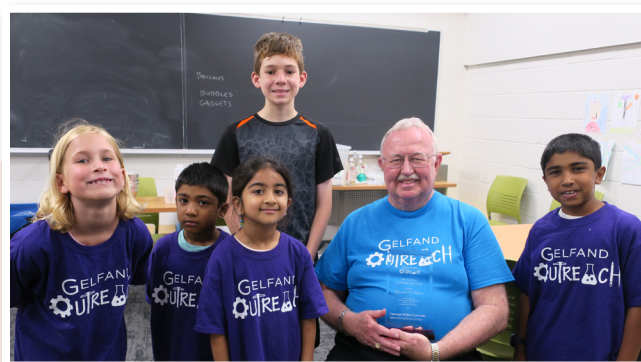
**THIS WORKSHOP IS FOR STUDENTS WHO ARE FAMILIAR WITH MINECRAFT AND HAVE A MINECRAFT ID. THE TIME WILL NOT BE SPENT TEACHING THE GAME, BUT WILL FOCUS ON USING MINECRAFT TO LEARN ENGINEERING.**

Learn how real engineers build and launch rockets in Minecraft. What about building a Robot in Minecraft? Imagine the strongest material in the universe. Can Minecraft teach you how to build it? Interested in video games? Do you play Monopoly? Learn how to make your own fun and educational game in Minecraft. Do you collect stones? Did you know Minecraft can build and help you learn about precious stones like diamond? Do you want to become an Engineer @ CMU? Come learn how to do this while playing Minecraft! STUDENTS WILL NEED TO BRING THEIR OWN NUT-FREE SACK LUNCH.

**COST: \$125.00**

**Dr. B. Reeja Jayan** is an Assistant Professor in Mechanical Engineering at Carnegie Mellon University (CMU). She also holds courtesy appointments in Materials Science and Engineering, Chemical Engineering, and Electrical and Computer Engineering departments at Carnegie Mellon. Dr. 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. Dr. Jayan directs the Far-from-Equilibrium Materials Laboratory (FEMLAB) at CMU. Her multidisciplinary lab harnesses electromagnetic fields to synthesize materials that access regions of the free energy/phase space diagram, hitherto unavailable to conventional synthesis routes. These low temperature processed materials directly grow on flexible, lightweight substrates like fibers, enabling structurally integrated energy harnessing, storage, and sensing. Dr. Jayan is a strong believer in game-based learning methodologies that she uses extensively in her undergraduate and graduate courses. Dr. Jayan is a recipient of 2017 Army Research Office (ARO) Young Investigator Award, 2016 Air Force Office of Scientific Research (AFOSR) Young Investigator Award, the Donald L. and Rhonda Struminger Faculty Fellowship, the Berkman Faculty Development Fund, and Pittsburgh Magazine's 40 Under 40 Award.

Students from the Gelfand Outreach Summer 2019 classes host visitor and Gelfand Outreach Donor, Bernard Meisner (S '71.)





Courtney Daylong

## RESEARCH @ CMU GRADES 6-8

July 13<sup>th</sup> - 17<sup>th</sup>

Students will be introduced to faculty members and graduate students who conduct cutting-edge science, computer science and engineering research at Carnegie Mellon. Through discussions, tours, and hands-on activities participants will learn about studies that are designed to solve societal problems, application of science and mathematics content that they are learning in school, and about pathways to careers in STEM fields.

**Courtney Daylong** is a Carnegie Mellon University, Heinz College alum. She was a Teaching Assistant for the Communications/Public Speaking course and holds a Masters in Public Management with a focus in Strategic Planning. She's spent a decade in executive leadership as a District Manager and Regional Vice President in education and with American Honda Motor Co. throughout the Midwest and Los Angeles. She has also completed doctoral studies in public policy at the University of Southern California and earned a Bachelor of Arts in Education. Now, having three little boys, she owns a nationally recognized nutrition consulting business focused on women's and children's health, giving back, and partnering with like-minded organizations.



Marieke Van Der Maelen

## ROBOTICS AND BIOMIMETICS GRADES 6-8

June 15<sup>th</sup> - 19<sup>th</sup>

This camp will be an introduction to mechanical engineering and robotics for students interested in world-building and interactive art. With a unique focus on biomimetics, or the imitation of natural models and creatures, this program is designed to challenge students to critically observe and find inspiration from the natural world. Through the integration of Shape Memory Alloys (SMA), electrical circuits, and paper engineering, students will work together to create a high/low tech universe populated by whimsical robotic creatures. Each student will take home their own moving creation at the end of the camp.

**Marieke Van Der Maelen** is a 3D modeler and product of the Carnegie Mellon Pre-College Art program. Through CMU, she was exposed to local art conservators, and later pursued a career as an art conservator in Chicago, where she preserved period clothing for the Harley Davidson Museum in Milwaukee, conserved ethnographic textiles from Japan and West Africa, and restored a rare Finn Juhl "floating couch." Her desire to share her knowledge with the next generation as well as connect traditional conservation practices with modern technology led her to bring her work to the classroom where she taught the science behind art conservation to students at the University of Chicago's Charter School System. Her background in art, science and education continue to inform her current research: combining augmented reality with blockchain to redefine how people experience and interact with visual art, culture, and entertainment.



Biohybrid and Organic Robotics Group

## ROBOTICS 101 GRADES 6-8

July 20<sup>th</sup> - 24<sup>th</sup>

This course is an introduction to robot-building and robot-programming. Using LEGO® pieces and the Arduino board, we'll design and build desktop mobile robots, then program them to do dances, follow lines, and "sense" different objects in the environment. Will you be able to program your robot to bowl? Will your robot successfully be able to navigate through a maze without getting stuck? This is a team-based, hands-on course. No experience in robotics is required.

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.

## SCIENCE AND ENGINEERING SUMMER SAMPLER GRADES 3-5

June 15<sup>th</sup> - 19<sup>th</sup>

Students will visit a variety of labs and spaces at Carnegie Mellon to learn about cutting edge research. Faculty, graduate students and staff in science, engineering and computer science will share information, demonstrations and hands-on activities to help Sampler participants to develop a broader understanding of what it means to work as a scientist or engineer. Students will summarize the information that they have learned and to make connections between the research activities and the content that they are learning in school.

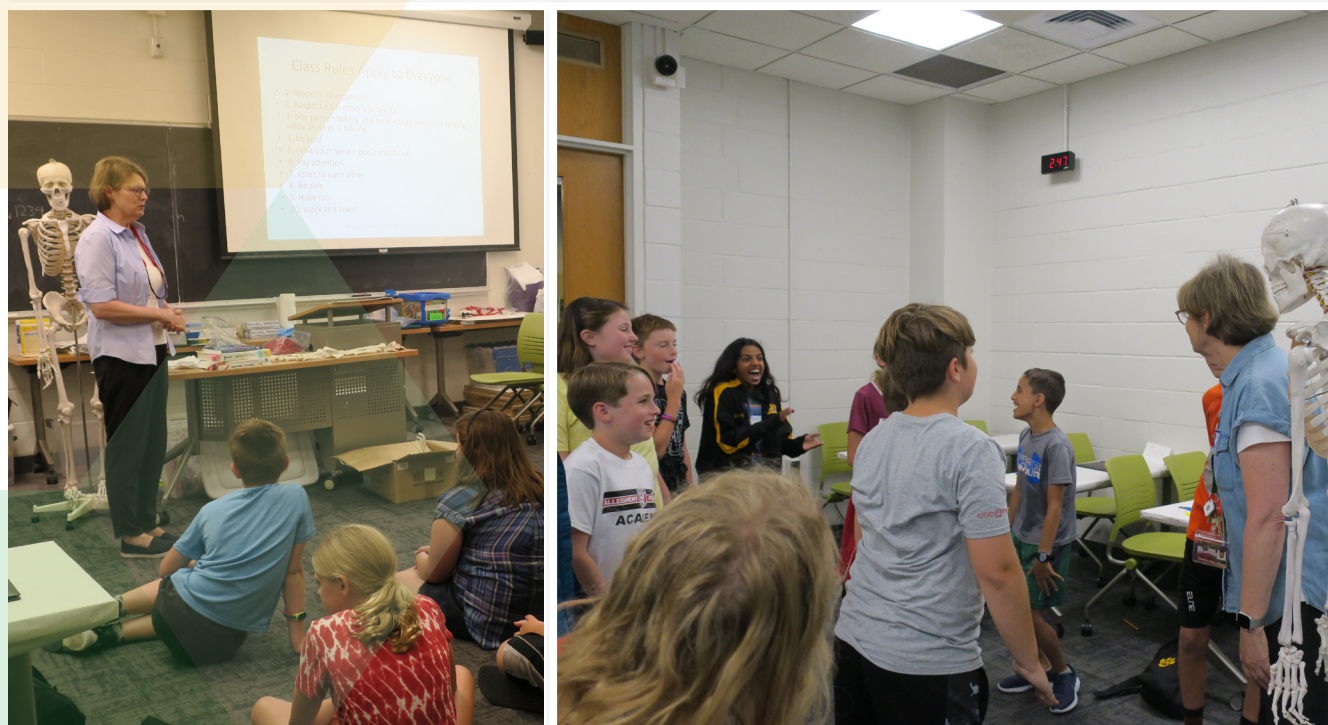
*Courtney Daylong* is the instructor for this class. Please see her biography on page 5.

## SUMMER SUPER HERO SCIENCE GRADES 3-4

June 22<sup>nd</sup> - 26<sup>th</sup>

Have you ever wondered how Spider-Man is able to swing through the Big Apple and stick to walls? Ever wonder why Wolverine's claws can cut through anything? Or even how Ant-Man is able pack a punch while he's so tiny? If you're curious how superheroes do what they do (and maybe even secretly want to become one yourself), then this is the class for you! Spend the week learning how we can use materials science to explain superhero powers and learn how to make some super-materials for yourself.

*Jasio Santillan* is the instructor for this class. Please see his biography on page 3.



Dr. Terry Richards teaches the Anatomy and Robotics course to a group of students during the Gelfand Outreach Summer 2019 session. Students learn about skeletal structures, anatomy and physiology, programming and robotics in this exciting, interdisciplinary workshop!





## Summer 2020 Series Classes

Classes are \$325.00 each\* and are conducted from 9:00AM to noon at Carnegie Mellon University.

Class Name	Dates	Grades	Brief Description
Science and Engineering Sampler	June 15-19	3-5	Visit labs and areas at CMU to learn about cutting edge research! Faculty, graduate students and staff in science, engineering and computer science will share information, demonstrations and hands-on activities.
Anatomy & Robotics	June 15-19	5-7	Learn the anatomical concepts of the bones and muscles that make up the human arm. Program a circuit board and make your model come to life.
Robotics & Biomimetics	June 15-19	6-8	An introduction to mechanical engineering and robotics for students interested in world-building and interactive art. A focus on biomimetics, or the imitation of natural models and creatures, students make observations from the natural world to create models.
Junk Bots	June 22-26	K-2	What are robots and what makes robots work? Explore how engineers build machines and make modifications to robots. Draw and design your own junk bot, bringing it to life with household items!
Summer Superhero Science	June 22-26	3-4	Have you ever wondered how Spider-Man is able to swing through the Big Apple and stick to walls? Ever wonder why Wolverine's claws can cut through anything? If you're curious how superheroes do what they do, then this is the class for you!
From Photons to Photos*	June 22-26	9-12	Light and its interactions with the world around us is a fascinating topic at the center of many scientific disciplines. This workshop is an introduction to the physics of light, with a focus on topics relating to imaging and displays. <b>Cost: \$50</b>
Kitchen Chemistry	July 6-10	K-2	Join your fellow scientists as we use everyday ingredients to conduct experiments and learn the science explaining them. Learn about solids and liquids by making your own glop!
Introduction to Materials Science	July 6-10	5-7	The focus of this class is on relating material properties to superpowers and uses existing superheroes to illustrate the concepts. Topics include chemistry compounds, the Periodic Table, and types of bonding.
All STEAM Ahead!	July 13-17	K-2	All aboard! Create, discover, and learn Science, Technology, Engineering, Arts, and Math. Students will sample the different parts of STEAM, making connections between the things around us and how they work.
Research @ CMU	July 13-17	6-8	Students will be introduced to faculty members and graduate students who conduct research at Carnegie Mellon. Discuss, tour, and participate in hands-on activities.
Robotics 101	July 20-24	6-8	Build and program robots! Using LEGO® pieces and an Arduino, design and build robots. Program your robot to do dances, follow lines, and more.
Learn Engineering @ CMU thru Minecraft*	July 20 <b>ONLY</b> 10am - 4pm	4-7	For students who are familiar with Minecraft and have a Minecraft ID. The focus is on using Minecraft to learn engineering. Prerequisite: knowing how to use Minecraft and Minecraft ID. <b>Cost: \$125</b>

To apply for scholarship funds, please submit a copy of the first page of your IRS 1040 tax form from 2018.

\* Unless otherwise noted.