SCIENCE RENDEZVOUS

KINGSTON 2018

Saturday May 12, 2018

10:00 AM to 3:00 PM

The Rogers K-ROCK Centre
& The Tragically Hip Way

SCIENCE RENDEZVOUS

Queen's UNIVERSITY

Program & Schedule and Science Experiments to Do at Home

Welcome

from Lynda Colgan and Kim Garrett,
Science Rendezvous Kingston Coordinators

Since it began in 2011, *Science Rendezvous Kingston* has been described as a celebration of STEM (science, technology, engineering and mathematics) subjects and specialists. Over the years, we have featured programmable robots, bats and turtles, geometric sculptures, flight simulators, an inflatable planetarium, a giant colon, and much more to bring physics, chemistry, biology, environmental science, engineering, and mathematics to life by sharing applications of STEM to our world.

This year, the national theme of *Science Rendezvous* is FULL STEAM AHEAD. The addition of the "A" is no mistake. The "A" signifies the integration of the Arts (including music, painting, sculpture, photography, drama and dance) into the traditional STEM domains.

What will you see and experience that is new at *Science Rendezvous Kingston 2018* as we strive to include the arts in our interactive displays and presentations?

For a start, you will see Leonardo da Vinci celebrated for his brilliant self-supporting bridge. Leonardo designed this bridge while he was under the patronage of Cesare Borgia. Borgia employed Leonardo as his military engineer whose task it was to design and build magnificent machines of war. One such machine was this simple, yet ingenious bridge. It required no specific skills to manufacture the parts, apart from a few men that were handy with an axe. It could be carried by a handful of men into any battlefield. It required no nails or ropes to hold it together and was capable of holding a substantial amount of weight.

At the *Math Midway*, you can explore anamorphic art: beautiful creations that can only be seen in the reflection of a mirrored cylinder. *Leonardo's Eye* (Leonardo da Vinci, c. 1485) is the earliest known definitive example of perspective anamorphosis. At the *Math Midway*, you can use our special "magic mirrors" to decode amazing images that have been distorted using a special grid. Or, you can colour your own anamorphic grid design and then challenge others to guess what your creation is before the big unveil, using a magic mirror created at home.

Science Rendezvous Kingston 2018 is the proud host of *Science Exposed*: 22 world-class photographs that portray STEM research through a creative lens. From the microscopic to the large-scale, these images give us insight into important environmental, cellular and geological issues. Here's a look at *Don't bite off more than you can chew* by Christopher Somers from the University of Regina, a photo of an American White Pelican who has just captured a large fish while foraging in a southern Saskatchewan creek in the early spring.

For the ultimate blend of STEM and the Arts, *Science Rendezvous Kingston* is thrilled to feature the two brilliant STEM communication specialists, Mitchell Moffit and Gregory Brown, who employ white boards, creative cartoon drawings, music, and fun explanations to make science accessible, debunk some widespread myths and answer niggling questions like *What happens in one lifetime?*

We have only begun to scratch the surface of all the new features and things to do at *Science Rendezvous Kingston 2018* – all of which are possible only because of the generous and ongoing support of Dr. Benoit Bacon, Provost, Queen's University and Dr. John Fisher, Interim Vice-Principal (Research), Queen's University. This event would not be possible without the donation of the Rogers K-ROCK Facility by Stephen Peck, Sales Manager, Rogers Media Kingston, and the efforts of Lynn Carlotto, Simon VanAsseldonk and Matt Pollard of the Rogers K-ROCK Centre to coordinate the myriad details behind the scenes of Canada's largest pop-up STEAM Discovery Centre.

Lynda Colgan Kim Garrett

SCHEDULE OF EVENTS

WHAT?	WHO?	WHERE?	WHEN?
Opening Ceremony	Mayor of Kingston, Bryan Paterson Town Crier, Chris Whyman	The Tragically Hip Way	9:50 a.m.
Doors Open	Science Rendezvous Volunteers	Main Doors, Rogers K-ROCK Centre The Tragically Hip Way	10:00 a.m.
Chemistry Magic Show	Dr. Kevin Stamplecoskie and Queen's Chemistry Graduate Society	Stage in the Rogers K-ROCK Centre Bowl	11:00 a.m.
Baja Vehicle Demo *(The Baja Vehicle is a single driver off-road vehicle)*	Queen's BAJA SAE Team	The Tragically Hip Way	Throughout the Day
Live AsapSCIENCE Show	Mitchell Moffit and Gregory Brown	Stage in the Rogers K-ROCK Centre Bowl	1:30 p.m.

All Day <u>Inside</u> the Rogers K-ROCK Centre:

- Exciting Demos and Interactive Displays
- Opportunity to sign the thank you banner for Rick Mercer
- Graffiti Wall – we want to hear from you!

All Day <u>Outside</u> the Rogers K-ROCK Centre:

- Solar Telescopes: RMCC Astronomy and Astrophysics, Royal Astronomical Society of Canada, Queen's Observatory
- Tech 'n Tinker Mobile Makerspace
- Queen's Chemistry Graduate Student Society

NEW THIS YEAR!

AsapSCIENCE

Science Rendezvous Kingston is proud to host Canadian YouTube sensations Mitchell Moffit and Gregory Brown for a live show. Launched in 2012, AsapSCIENCE has risen to international success and is now one of the most prominent science education channels on YouTube. Are you one of the more than 7.5 million people who subscribe to their weekly YouTube web series? If not, you are sure to be after the show!

AsapSCIENCE was created by Mitchell and Greg as a way to stay connected with the science community after finishing their BSc degrees at The University of Guelph. AsapSCIENCE aims to make science fun and accessible to people from all walks of life, by tackling questions and issues in a different way than most. Two of their most popular videos have been *Which Came First, the Chicken or the Egg* and *What Colour is this Dress?*

In an interview with Michael Oliviera from the Guelph Mercury Tribune, Mitchell said, "[We wanted to] reach people who might think they're not interested in science but if they really knew some of the cool stuff that was actually integrated in their own lives, maybe they'd find it interesting. So it kind of grew out of the idea of wanting to share the awesome things we had learned. Trick them into learning science."

In an interview in The Ontarian, The University of Guelph's student newspaper, Mitchell and Greg said that after certain lectures, they would feel an overwhelming desire to share what they learned about science with people around them. They understood that relatable topics, such as food, sleep, alcohol, coffee, and sunshine could get people excited about science. They also felt that creating a video with a title such as "The Health Benefits of Vitamin D" wouldn't generate much interest amongst the many stimulating videos available on the internet. In order to make science entertaining without sensationalizing it, they decided they'd have to take things one step further by christening their videos with creative titles as a "hook." For example, their video on vitamin D was called, *What If You Stopped Going Outside?*

We hope that you will be inspired by the AsapSCIENCE team and share in their passion for continuous learning and enthusiasm for debunking myths about science in ways that are fun and informative.

On your behalf…thank you Mitchell and Greg. The goal of *Science Rendezvous Kingston* is to honour scientists and scientific research; and, to stimulate public interest in science with the ultimate goal of encouraging more children and youth to pursue STEM courses and careers. By joining us today, you have helped us to achieve our aim. Through your AsapSCIENCE videos, you will keep the spirit of *Science Rendezvous Kingston* alive for years to come

MITCHELL

Mitchell has always been captivated by the world around him and understanding the science in our daily lives. After receiving a Biological Science degree from the University of Guelph, he became fascinated by YouTube's potential to teach and reach people from around the world. With the combination of his partner Gregory Brown, AsapSCIENCE was born with the intent to educate, entertain and inspire people to a similar love of science.

GREGORY

Gregory attended the University of Guelph for a Bachelor of Science in Biological Science and minor in Visual Art. Passionate and curious about teaching he then went on to receive his Bachelor of Education from the University of Toronto. Using his skills as an educator, artist and scientist Gregory is a dynamic part of the AsapSCIENCE team.

Science Exposed

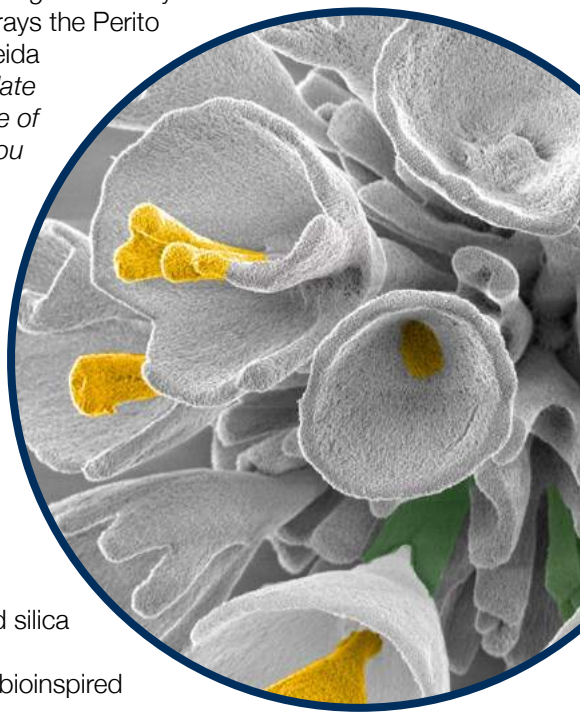
Science Rendezvous Kingston is proud to host the 22 winning and finalist images from the 2016 Science Exposed (National Sciences and Engineering Research Council of Canada [NSERC]) contest and *La preuve par l'image*—a similar competition held by the Association francophone pour le savoir (Acfas).

The competition is devoted exclusively to images of scientific research, in all fields of study, and is open to all individuals or groups who carry out research in the public or private sectors.

The purpose of the competition is to showcase images of Canadian research; foster interest in science and scientific curiosity in all audiences; build a database of scientific images of Canadian research; and, contribute to the advancement of knowledge and to new uses of scientific images.

The images represent diverse fields and topics.

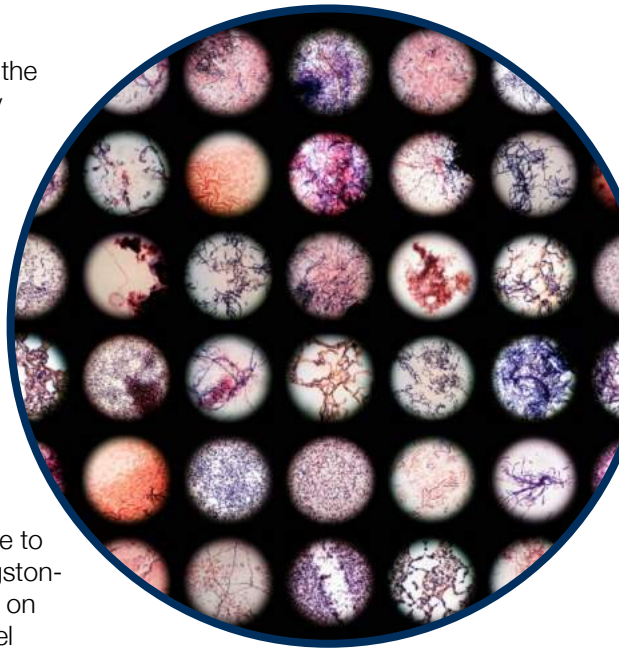
For example, Jury Prize Winner, *Walking on time* by Felipe Almeida (HEC Montréal) portrays the Perito Moreno Glacier, a place where Almeida believes that *you can fully contemplate nature. While walking on the ice, one of the guides asked Felipe Almeida, "You do get that we are walking on time, right?". That struck him right away because, until that moment, he hadn't stopped to think that some of deeper layers of the glacier are from many different ice ages long ago. What was life like back then? What animals were there? So many questions. Nature is indeed amazing.*



Calla lilies from a chemical garden by Alicia McTaggart from Concordia University are anything but your garden-variety blossoms: though the flowers in this bouquet bear a remarkable resemblance to calla lilies, they are sub-millimeter-sized barium carbonate crystals. These microstructures require barium chloride "seeds" and sodium silicate to form. The addition of carbon dioxide into the solution causes the precipitation and spontaneous assembly of barium carbonate and silica (a major component of sand), resulting in the flower-like structures. This class of self-assembled microstructures represents the promise of one day being able to recreate bioinspired materials with the same control and perfection as is done by nature.

NEW THIS YEAR!

Art the Science



Art the Science is a Canadian not-for-profit organization committed to celebrating the connections between art and science. Art the Science facilitates cross-disciplinary relationships between artists and scientists with a goal of fostering Canadian science-art culture. In doing so, we aim to advance scientific knowledge communication to benefit the public, while providing opportunities for artists to exhibit their work in unconventional and technologically innovative ways. By nurturing the expression of creativity, be it in a test-tube or with the stroke of a brush, Art the Science has become one of the most beloved and popular online SciArt (science + art) communities in the world. Since 2015, it has developed numerous digital SciArt exhibitions, and has highlighted the work of both pioneering and upcoming SciArt artists internationally. The organization also promotes the role of SciArt by conducting various outreach initiatives, including delivering lectures and keynote presentations designed to foster public engagement and a deeper appreciation of science and art.

For Science Rendezvous 2018 Art the Science will present Microbiota, a visual ode to the billions of teeming of bacteria which inhabit Kingston's water, soil, and air. Kingston-based multimedia artists Julia Krolik and Owen Fernley set out to shine a spotlight on some of the bacteria we share space with, but which can still make many of us feel uncomfortable. The fact is that we need bacteria! It's inside us and all around us, helping us to break down environmental pollutants, digesting the food we eat, benefitting the crops we harvest and protecting us from disease. Get up close and personal with bacteria at Microbiota, a digital display of images designed to let Science Rendezvous visitors come face to face with our unseen and under-appreciated environmental co-habitants. Visit each of Microbiota's stations to learn about the diversity of bacteria in our city.

Leonardo da Vinci's Arch Bridge

Come catch a glimpse of the City of Kingston museums' exhibition *Leonardo da Vinci: relentless curiosity* featured this summer at the PumpHouse.

How do we get to the other side? No Nails! No Glue! No Ropes! No Problem! Use only wood to construct a self-supporting arch bridge based on the drawing and concept of famous Renaissance artist and inventor Leonardo da Vinci. Challenge yourself to build bridges big and small just like Leonardo!

PUMPHOUSE
HISTORY *in* MOTION

MacLachlan
WOODWORKING MUSEUM

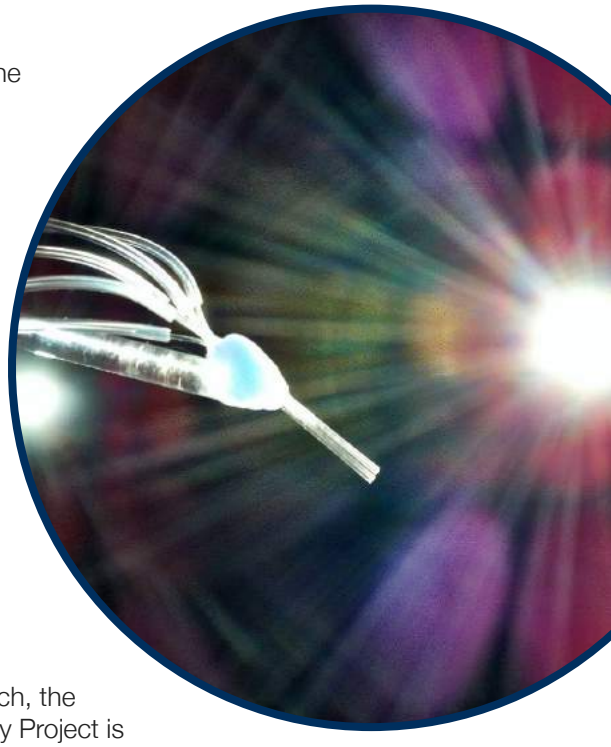
KINGSTON

Art of Research

Come explore the dynamic world of research at Queen's University!

The act of research can be a beauteous endeavour, whether it is conducted in the lab, in the field, in the studio, or in the archives. Launched in 2016, the Art of Research photo contest provides the opportunity for Queen's faculty, students, staff and alumni to showcase their research, scholarly, and artistic work in creative, provocative and engaging ways. The goal is to creatively capture the research process across disciplines and demonstrate the importance of research at the local, national and international levels.

The Art of Research photo exhibit highlights winners and shortlisted images from the contest, including:



Perfusion of Light
Raymond Sturgeon
PhD Student, Biomedical and Molecular Sciences
Location: Botterell Hall, Queen's University
This perfusion array allows for quick changing of solutions. Solutions with different drugs are applied while recording the bioelectrical activity of nerve cells. The handmade array, roughly the size of a matchbook and very fragile, is essential for determining drug effectiveness at the level of a single protein's function. Sturgeon used a dual-light source to construct it, using fine tubing, super-glue, wax, and half-millimetre glass barrels.

Evelyn Mitchell and her "Burler"
Dr. Laura Murray
Faculty, English and Cultural Studies
Location: Kingston, Ontario
Through oral history and archival research, the Swamp Ward and Inner Harbour History Project is revealing the twentieth-century history of two of the oldest neighbourhoods in Kingston, Ontario. Evelyn Mitchell worked at Hield Brothers Woolen Mill in the 1950s when she first arrived in Kingston from Yorkshire. In her interview, she describes in great detail the process by which she did "invisible mending" on the cloth coming out of the looms, picking out and pushing through loose threads. Here she displays the tool she used, a "burler," which she has saved to this day.

Magdalene
Dr. Una D'Elia
Faculty, Art History & Art Conservation
Location: Church of Santa Maria della Vita, Bologna
For over 550 years, the passionate Magdalene has been running with her veil streaming behind, screaming, to the body of Jesus, dead on the ground. This life-size statue, originally painted to mimic flesh and clothes, pushes the limits of the terracotta medium. Renaissance men and women could walk among Niccolo dell'Arca's sculptures, feeling as if they were present at this terrible moment in Christian history. D'Elia's research focuses on such living sculptures, stories of statues coming to life, and people touching, dressing, attacking, and generally treating sculptures as if they were alive.

NEW THIS YEAR!

Tech ’n’ Tinker Trailer

Connections Engineering Outreach at the Faculty of Engineering and Applied Science is proud to introduce The Tech ‘n’ Tinker (TNT) Trailer - a mobile makerspace designed to travel to schools, community organizations and public events in the greater Kingston area.

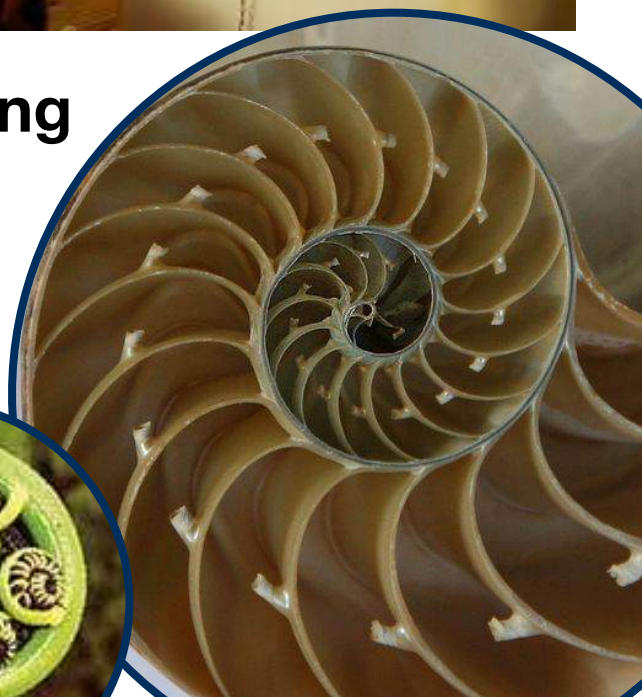
What is a makerspace? A makerspace is defined as a place where students can gather to create, invent, tinker, explore and discover using a variety of tools and materials. A makerspace can be anything from a repurposed bookcart filled with arts and crafts supplies to a table in a corner set out with LEGOs to a full blown fab lab with 3D printers, laser cutters, and handtools.

Science Rendezvous Kingston is proud to host the TNT Trailer – a state of the art Exploratorium equipped with tools and raw materials to bring robotics and so much more to life in creative, dynamic and purposeful ways!

Military Communications & Electronics Museum

Centre for Advanced Computing at Queen’s University

If you look at these photos of a cabbage plant, fern frond, and nautilus shell, you will notice that as you keep zooming in, you see the same pattern repeating over and over. If you were to keep dividing human lungs, bird wings, or coral reefs into smaller and smaller parts, you would find that you get a nearly identical reduced-size copies of the whole! Learn about nature’s geometry – where everything repeats and, as a bonus, take home a kit to grow your own veggie-fractal!



NEW THIS YEAR!

Showing #YGK Love for Rick Mercer

For the last four years, the host of CBC's *The Mercer Report* has supported *Science Rendezvous Kingston* with a video message that has changed over time. Some years, Rick has shared the excitement about our headliners. Other years he has thanked the 400 volunteers who make *Science Rendezvous Kingston* possible.

The Mercer Report is retiring after 15 seasons, and Rick will be moving on to new projects. So now it's our turn to say thank you to Rick for his generous encouragement of *Science Rendezvous Kingston* and STEM education through his high-profile promotional plugs.

Please sign our gratitude banner to say "thanks" and to wish Rick well in his future endeavours (which we hope will include many more visits to Kingston!).

We Want to Hear From You!

Grab some markers and write on our feedback wall to let us know what was best about this year's *Science Rendezvous Kingston* event. Make suggestions for next year. Tell us something that you learned. What inspired you? Surprised you?

Write a few words or draw a picture.

Throughout the day, volunteers will be circulating through the Rogers K-ROCK Centre with iPads loaded with an electronic feedback survey. It only takes a few minutes to complete, but the information is invaluable to the Coordinators who are already planning for Science Rendezvous 2019 on Saturday May 11th.

SAVE THE DATE!

MAY 2019

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
5	6	7	8	9	10	**11**
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

NEW THIS YEAR!

New This Year at the Math Midway

Can you guess what this drawing represents?

Is it a bird? A lizard? A Tyrannosaurus Rex? It is almost impossible to tell without a special decoder mirror…available only at The Math Midway. When you visit the Math Midway, you will have a chance to use magic mirrors to decipher our anamorphic art and have an opportunity to create your own indecipherable masterpiece, along with instructions on how to make your own magic mirror.

Mother's Day

Every year, *Science Rendezvous Kingston* happens on Mother's Day Week-End. The original intent was to celebrate women scientists who are also daughters, sisters, mothers, aunts, nieces, cousins and grandmothers by making a full week-end extravaganza. This year, at the Math Midway, you are invited to spend a few minutes making a woven heart gift basket as a Mother's Day gift or as a gift basket for someone special who has inspired you to learn and love STEAM subjects!

Tangram Puzzles

Did you know that the tangram puzzle originated in Imperial China during the Tang Dynasty? They are thought to have travelled to Europe in the 19th century on trading ships.

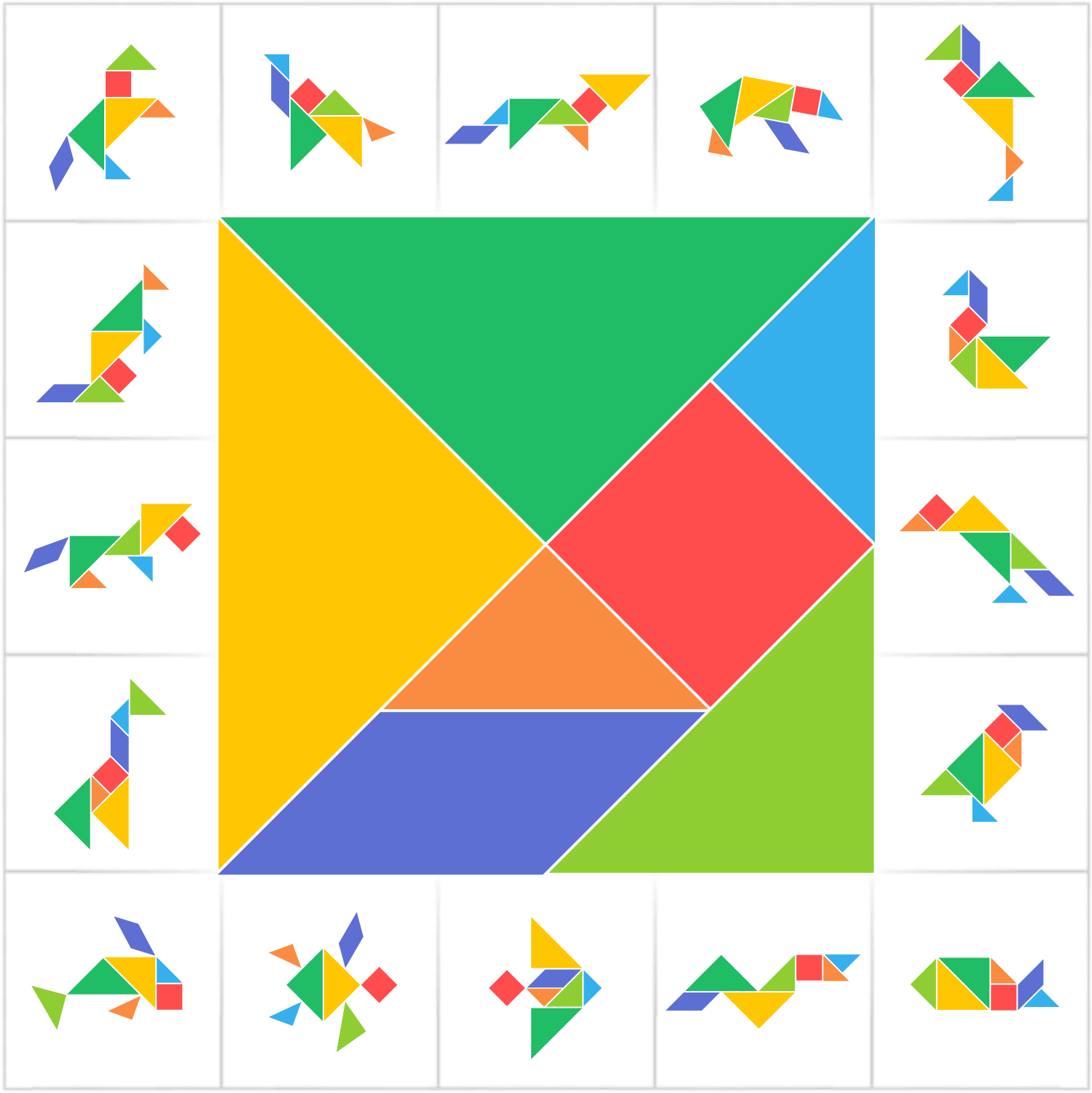
In China, tangram patterns are called "Chin-Chiao Pan" which translates to the "seven pieces of cleverness."

The shapes (five triangles, a square, and a parallelogram) are called tans, which are put together to form shapes. The objective of the puzzle is to form a specific shape (given only an outline or silhouette) using all seven pieces, which may not overlap. Over 6500 different tangram problems have been created from 19th century texts alone, and the current number is ever-growing.

At the Math Midway, you will receive a tangram puzzle to take home as well as introductory puzzle challenges.

NEW THIS YEAR!

Remember to pick up your own take-home tangram puzzle at The Mathematics Midway!



Try making these tangram puzzles at home!

VOLUNTEER APPRECIATION

Science Rendezvous Kingston is made possible by over 400 volunteers from Queen's University, The Royal Military College of Canada, St. Lawrence College, and the Greater Kingston community.

Thank you!

Your efforts are appreciated.

Presentations, Demonstrations, Hands-On Activities, Make & Take Workshops

ACTIVITIES AND PRESENTATIONS

Who We Are	What You'll Be Doing at Our Station	Volunteers
Art the Science	For Science Rendezvous 2018 Art the Science will present Microbiota, a visual ode to the billions of teeming of bacteria which inhabit Kingston's water, soil, and air. Kingston-based multimedia artists Julia Krolik and Owen Fernley set out to shine a spotlight on some of the bacteria we share space with, but which can still make many of us feel uncomfortable. The fact is that we need bacteria! It's inside us and all around us, helping us to break down environmental pollutants, digesting the food we eat, benefitting the crops we harvest and protecting us from disease. Get up close and personal with bacteria at Microbiota, a digital display of images designed to let Science Rendezvous visitors come face to face with our unseen and under-appreciated environmental co-habitants. Visit each of Microbiota's stations to learn about the diversity of bacteria in our city.	**Julia Krolik** **Alex Pedersen** **Owen Fernley** **Ryan Benvenuti** **Cat Lau** **Liam Rémillard** **Megan McNeil**
Boys and Girls Club **Bricks 4 Kidz**	Bricks 4 Kidz has exciting learning opportunities for you! Please join us to learn about our LEGO builds that use motors and battery packs. We teach Science, Technology, Engineering and Math concepts using LEGO bricks in our Camps, PA Day programs, In-School Lunch Hour Programs, Kids Night Out, Birthday Parties and more! Visit our table to create some Spin Art using our LEGO Spin Art Machines!	**Rosie Gatenby**
Cardiovascular Imaging Network at Queen's (CINQ)	This year, the Cardiovascular Imaging Network at Queen's University (CINQ) will present to you live demonstrations of ultrasound exams of the human heart, provide you with some simple steps to keep your heart healthy, and show you how to make your own paper origami heart to take home! Come explore the anatomy of the heart, watch how the heart pumps blood to provide our bodies with oxygen and nutrients, and even test out one of our state-of-the-art hand-held ultrasound devices on an ultrasound model!	**Dr. Amer M Johri** **Dr. Marie-France Hetu** **Julia Herr** **Olivia Yau** **Kayla Colledanchise** **Laura Mantella** **Christie Boswell-Patterson** **Devon Cole** **Milena Bullen** **Kiera Liblik**

Who We Are	What You'll Be Doing at Our Station	Volunteers
Frontenac, Lennox and Addington Science Fair	FLASF is excited to be participating in this year's Science Rendezvous. Meet young scientists from the Kingston Area! Grade 5 to 12 students will be demonstrating and presenting their projects from this year's Frontenac, Lennox and Addington Science Fair. While you are at the FLASF booth, learn more about the Science Fair with hands-on activities.	**Liz Suriyuth** **Linda Lamoureux**
King's Town	Investigating Buoyancy: *Ahoy there matey*! Design and make your own aluminum boat, load it up with treasure and set sail! See how much treasure your boat can carry without sinking. Investigate buoyancy, the upwards force exerted by fluid, and explore how a ship's form relates to its function.	**Kate Beattie** **Roxanne Garwood** **Kate Beattie** **Bryan Little** **Katherine Noyes** **Theresa Jones** **Leila Smaili** **Ava Simpson** **David Patterson** **Rachelle Bray**
Kingston Frontenac Public Library	Drop by the KFPL booth in the K-Rock Centre and get technical with our LEGO build table, make a working piano out of play dough and see a 3D printer in action! For all ages.	**Dana Salsbury** **Kathy** **Beth** **Elizabeth** **Hunter** **Riley** **Meena**

ACTIVITIES AND PRESENTATIONS

Who We Are	What You'll Be Doing at Our Station	Volunteers
Kingston Medical Makers Club	Interested in 3D printing? Come check out the Kingston Medical Makers at our station where we are 3D printing a prototype medical device for a developing rural area! Come see what projects we're working on and how you can get involved!	**Jessie Payne** **Clare Bekking** **Danika Wotten** **Kay Wu** 
Kingston Police	Learn about the world of policing at the Kingston Police Mobile Engagement Trailer (MET). The MET will be on site all day. Members of the Emergency Response Unit will also be participating, including Canine Officer Titan and Constable Mark McCreary, Sergeant Darren Keuhl (who will be piloting the new Unmanned Aerial Vehicle), and the Kingston Police Tactical Robot.	**Sgt Craig MacFarlane** **Sgt Darren Keuhl** **Cst Mark McCreary** **Cst Mike Rice** **Cst Rick Hough** **Cst Josh Brimble** **Cst Geoff Graham** **Cst Dale Clarke** **Cst Carolyn Gauthier** **Morgan** **Haley** **Sadie** **Augustyn**
Military Communications & Electronics Museum	The Military Communications and Electronics Museum displays the history of the Military Communications & Electronics Branch and its predecessor units from 1903 to today. The display which we will be bringing will be completely interactive and will demonstrate the changes in communications technology from the early days of the Canadian Signalling Corps to today.	**David McCarey** **Annette Gillis**
Museum of Health Care at Kingston	Pump it up! Get your pulse racing and your brain working with hands-on activities about blood and the circulatory system. Check out a gooey "blood" sample, explore an interactive model of the circulatory system, and discover the ancient practice of bloodletting!	**Kevin Moorhouse** **Julia Moreau** **Kaitlyn Schenk**

Who We Are	What You'll Be Doing at Our Station	Volunteers
NSERC Science Exposed	Science Exposed is a contest organized by the Natural Sciences and Engineering Research Council of Canada (NSERC) and devoted exclusively to images of scientific research, in all fields of study. In 2016, NSERC was proud to collaborate with the Association francophone pour le savoir (Acfas) and open La preuve par l'image to candidates all across Canada. Acfas is responsible for the Francophone segment, La prevue par l'image, and NSERC is responsible for the Anglophone segment, Science Exposed. Come and see how these beautiful photographs convey emotion, beauty, and even surprise, while also fostering curiosity.	
Lake Effect Robotics	Lake Effect Robotics will be demonstrating our 2018 competition robot and will have some hands-on activities for children. Team 2708, Lake Effect Robotics, is a school-board wide FIRST Robotics team from the Limestone District School Board. 2708 began in late 2016 when teams 2809, K-Botics, from KCVI and 3710, FSS Cyber Falcons, from Frontenac Secondary School merged. The team consists of people from multiple grades and schools, and we are proud to have such diversity in our team and in the world of robotics.	**Members of the Lake Effect Robotics Team**
Professional Engineers of Ontario	Displays, focusing on the variety of disciplines available to engineers. Mechanical, Civil, Environmental, Chemical, and Electrical engineers will be available to discuss the basic sciences behind each activity.	**Ashley Hosier**

ACTIVITIES AND PRESENTATIONS

Who We Are	What You'll Be Doing at Our Station	Volunteers
Queen's Chemistry Loock Laser Lab **Loock Laser Lab**	Visit our booth to experience a 'stealth' computer screen, learn how your TV remote works, and watch us light matches with a laser!	**Dr. Peter Loock** **Amy MacLean** **Andrew Williams** **Cameron Reid** **Si Jia Li** **Travis Ferguson** **Omar Yaman** **Willem Day**
SCIENCE Quest **Science Quest**	Stop by the Science Quest booth to explore the cool and crazy Jade robots, what are you waiting for!	**Sarah Hatherly** **Leah Vignale** **Charlotte Sugden** **Natalie Arpin** **Nick Neokleous**
centre for neuroscience studies AT QUEEN'S UNIVERSITY **Centre for Neuroscience Studies at Queen's University**	Join the concussion education team and try out some hands on experiments.	**Julia Morris** **Heidi Riek** **Tali Baird** **Jonny Coutinho** **Kayne Park** **Nicole Czegledy** **Emma Walton** **Rachel Yep**
 **Queen's University Observatory**	The first Queen's Observatory was established in the mid-19th century, the beginning of a long and distinguished history of astronomical observing at Queen's University. The current Observatory houses a 14-inch reflecting telescope in a dome on the roof of Ellis Hall. You are invited to come and experience the wonders of our Universe from the smallest planets to the largest galaxies! Regular monthly Open House public sessions - free- are organized in collaboration with the RASC every second Saturday of the month.	**Nikhil Arora** **Matthew Chequers** **Connor Stone**

ACTIVITIES AND PRESENTATIONS

Who We Are	What You'll Be Doing at Our Station	Volunteers
Queen's University Faculty of Engineering and Applied Science Connections	Tech 'n' Tinker Trailer which is a mobile Makerspace. A Makerspace is a physical location where people gather to share resources and knowledge, work on projects, network, and build. Makerspaces provide tools and space in a community environment.	**Scott Compeau** **Kurt Bagg** **Emily Garrett** **Tianna Lombardo** **Cody McLaughlin** **Grace Waddington**
Enrichment Studies Unit at Queen's University	Come and use your creative thinking to solve fun, hands-on math and science activities. At our station, you will practice your team building skills as you work with others or your family to find a solution.	**Linda Lamoureux** **ESU Volunteers**
Queen's University Department of Chemistry	The Chemistry Magic Show is fun for the whole family and features explosions, amazing glow-in-the-dark substances, fantastic colour changes, spontaneous combustion reactions and more!	**Dr. Kevin Stamplecoskie** **Hannah Ramsay** **Kasia Donovan** **Jaddie Ho** **Zach Ariki** **Bailey Smith** **Sarah Ellis** **Mina Narouz** **Ramjee Kandel**
Queen's University Child & Adolescent Dev. Group Dept. of Psychology	We will be displaying a number of games appropriate for different age-levels of children ranging from video games to brain puzzles-all of which are related in some way to brain development.	**Beth Kelley** **Stanka Fitneva** **Mark Sabbagh** **Valerie Kuhlmeier** **Pablo** **Bree** **Hannah** **Brooke** **Shanahan** **Tara** **Haykaz** **Kalee** **Caitlin** **Samantha** **Olivia**

ACTIVITIES AND PRESENTATIONS

Who We Are	What You'll Be Doing at Our Station	Volunteers
Queen's University Department of Physics, Engineering Physics, and Astronomy, SNOLAB Group	Ever wonder what happens at SNOLAB, one of the deepest and most advanced physics labs in the world? Meet SNOLAB "ghost particle" (neutrino) and dark matter hunters, and join them in shooting a homemade vacuum rocket launcher, "seeing" real subatomic particles in a cloud chamber, and much more!	**Alex Wright** **Daniel Durnford** **Elizabeth Fletcher** **Szymon Manecki** **Nathalie Ouellet** **Ian Lam** **Quentin Arnaud** **Ben Tam** **Ken Clark** **Mark Anderson** **Yan Liu**
Queen's University Let's Talk Science	Showcasing the power of the human mind, we will explore areas like memory and learning! Evaluate your hand-eye coordination with our mirror tracer task and see how fast you can learn with our maze task. We will also have a take home activity for each visitor focusing on optical illusions to continue the fun at home.	**Rahul Patel** **Sarah Abdullah** **Erica Tropea** **Harrison Leach** **Abbey Dudas** **Rory Bagacki** **Jasmine Buddingh** **Lara Milliken**
Queen's University Department of Chemical Engineering The Barz Research Group	Hands-on experience to make energy conversion devices: 1) Make a battery using two nails and a lemon and measure the voltage. 2) Make an electrolyser to produce hydrogen and oxygen from simple things like two pencils, a battery, water and baking soda. 3) Make a fuel cell which produces electrical power from hydrogen and chlorine using simple things like two pencils, a battery, water and salt	**Dominik Barz** **Mahmoud Khademi** **Ali Khazaeli** **Sreeman Mypati** **Melissa Barz** **Merit Barz**
Queen's University Department of Chemistry Graduate Studies	Hands-on Chemistry: Learn about chemistry, the science of matter, through hands-on activities including drawing with secret ink, expanding balloons, and bubbles.	**Joshua Clarke** **Alex Veinot** **Christene Smith** **Marshall Timmermans** **Jasmine Buddingh** **Alisha Szozda** **Lorena Ucciferri** **Eduardo de Barros Ferreira**

Who We Are	What You'll Be Doing at Our Station	Volunteers
Queen's University School of Kinesiology Biomechanics and Ergonomics Lab	Do you want to know why and how we move in different sporting examples and what effect these might have on sporting outcomes? For example, how can anyone jump high enough to dunk a basketball? And why are hockey players' slap shots so much faster than yours? The Queen's University Biomechanics and Ergonomics Lab will explain it all!	**Dr. Pat Costigan** **Tara Diesbourg** **Megan McAllister** **Markus von Hacht** **Josh Davies**
Queen's University Department of Mechanical and Materials Engineering	We will be performing a demo regarding "Bio-inspired Flight".	**David Rival** **Lindsay Gibson** **Clinton Bond** **Louis Burelle** **Carolyn Fisher** **Josh Galler** **Lindsay Gibson** **Adnan El Makdah**
Queen's University Physics Dept Optical Society of America	There are some 2D and 3D hologram plates with different images recorded on them. When holograms are irradiated with a laser or white light at a specific angle, the original images are reconstructed.	**Behnaz Seyedahmadi** **Thomas Faour** **James Godfrey** **Kate Fenwick** **Leila Mazaheri**
Centre for Advanced Computing at Queen's University	Ever try to measure the length of a cloud? Or see how many points a snowflake really has? The answer to both is … infinite! Come learn about fractals – nature's geometry, where everything repeats. Come learn about fractals – nature's geometry, where everything repeats. See fractals in nature (ferns, clouds, Nautilus Shells), in everyday use (antennas, sponges), apps you can use at home, and grab some seeds to create your own veggie-fractal!	**Don Aldridge** **Ken Edgecombe** **Hartmut Schmider** **Michael Hanlan** **Hung Tam** **Austin O'Boyle** **Jim Estes** **Shelley Zhou** **Amal Khalil** **Shadi Khalifa**

ACTIVITIES AND PRESENTATIONS

Who We Are	What You'll Be Doing at Our Station	Volunteers
Queen's University School of Medicine Clinical Simulation Lab	Come be a medical student for a few minutes. Learn how to resuscitate a non-breathing person and how residents learn how to do laparoscopic surgery.	**Kim Garrison** **Cathy Santyr** **Esther Falkson** **Erin Huitema**
Queen's University Bio-Mechatronics and Robotics Laboratory Department of Mechanical and Materials Engineering	We will demonstrate wearable technologies, including human power generation, and wearable systems for movement tracking. We will bring energy harvesting devices, and a full body motion capture system.	**Dr. Qingguo Li** **Tong Li** **Michael Shepertycky**
Queen's University Research	Come explore the dynamic world of research at Queen's University! The act of research can be a beauteous endeavour, whether it is conducted in the lab, in the field, in the studio, or in the archives. The Art of Research photo contest provides the opportunity for Queen's faculty, students, staff and alumni to showcase their research, scholarly, and artistic work in creative, provocative and engaging ways. The Art of Research photo exhibit highlights winners and shortlisted images from the contest.	**Melinda Knox** **Leigh Cameron**
Queen's University Baja SAE Design Team	Our design team provides students with a variety of hands-on experience in design, project management, business correspondence, and manufacturing. Knowledge is passed down through peer interaction and faculty guidance, which creates a friendly, collaborative learning environment. Baja SAE also introduces students to the competitive nature of the consumer industrial market, professionalism and financial organization. Our members are involved on a voluntary, interest-driven basis and have found that the experience they gain from Baja provides an unparalleled advantage in the job market upon graduation.	**Michel Hache** **Ben Stafl**

ACTIVITIES AND PRESENTATIONS

Who We Are	What You'll Be Doing at Our Station	Volunteers
Queen's University Faculty of Education Community Outreach Centre	At the 2018 Mathematics Midway, you will have a chance to make art with tangram puzzles (and get a set to take home). You can also make a tessellation tile, explore unusual anamorphic art and make a woven heart basket.	**Codie Kish** **Erin Mick** **Tina Murphy** **Gregory Smythe** **Jenn Wilson**
Queen's University Laboratory for Percutaneous Surgery, School of Computing	The Mobile Image Overlay System (MIOS) and computer-assisted surgery pig! The MIOS is a demonstration of a medical system that allows a user to perform a complex procedure in relation to a pre-operative MRI/CT image. When a user moves the position of the model skull, the CT image on the screen also moves accordingly. Our computer-assisted surgery pig is a simple demo to show how surgical instruments can be tracked in relation to a patient.	**Hillary Lia** **Emily Rae** **Shaun Lund** **Grace Underwood** **Zac Baum** **Mark Asselin** **Jacob Laframboise** **Rachael House** **Brandon Chan** **Hillary Lia**
Queen's University, Office of the Vice-Principal (Research) **Heart & Stroke Foundation of Canada**	Dr. Kyra Pyke and her team along with the Kingston chapter of Heart & Stroke Canada will provide an interactive activity that focuses on educating children and their families on how everyday experiences like exercise, food choices and psychological stress impact our arteries. Cardiovascular disease progresses silently for many decades prior to the development of symptoms. Dr. Pyke's research is focused on aspects of arterial function and structure that begin to change early in the disease process.	**Marnie Girard** **Cory Watkins** **Rory Warnock** **Jefferson Chuong** **Kelly Blair-Matuk** **Kyra Pyke** **Amanda Byrne** **Kaitlyn Liu** **Jenny Williams** **Josh Tremblay**
Queen's University Biological Station **Biology Elbow Lake Environmental Education Centre** **Eco-Adventure Camp**	What's lurking beneath? Fish, frogs, bugs, and more! Join us as we investigate the creatures that live in our lakes and rivers. Identify some species and learn how you can tell what a healthy ecosystem looks like!	**Emily Verhoek** **Kelly Buckholtz** **Kathleen Waterston** **Josh Baker**

ACTIVITIES AND PRESENTATIONS

Who We Are	What You'll Be Doing at Our Station	Volunteers
Rideau Public School Lego Club: The Rhinobots	Come and take part in our hands-on play and learn about Lego robotics. You are guaranteed to have fun!	**Wendy Dossett and members of the Rhinobots First Lego League Team**
RMCC Military Psychology and Leadership Department	At our station, there will be: robots children can make themselves (on paper with stickers); a robot puzzle dice game involving rolling a dice and putting the robot puzzle piece down that corresponds to the number rolled; a robot that children can program to go through a maze; and, small wind-up "robots." For adults or older children, we will have a binder that summarizes psychological research conducted in the domain of robots.	**Dr Adelheid Nicol** **Eliza Bruce** **Rachel Fritz-Nemeth De Friedenlieb** **Alexandra Horeczy** **Jordan Johnston** **Justin Kellermann-Thompson** **Ariane Mayrand Nicol** **Alexandra Paquette** **Haley Saulnier** **Maria Zhurov**
RMCC Civil Engineering	Learn about contour maps in 2D and 3D. Change the contour of the land to control the flow of water. Make it rain and see how water flows over the land.	**Kristine Mattson** **Veronique Fournier** **Majda El-Jaat** **Jean-Luc Armstrong**
RMCC Astronomy and Astrophysics	We will have solar telescopes to safely view the sun, as well as informational handouts about several astrophysical phenomena, and details about the Queen's Observatory in the Ellis Hall Auditorium - the coordinator of the observatory will be in attendance!	**Susan Gagnon** **Colin Lewis** **Ananthan Karunakaran** **James Sikora** **Melissa Munoz** **Dhruv Bisaria**

Who We Are	What You'll Be Doing at Our Station	Volunteers
RMCC Chemistry and Chemical Engineering Zeeb Phytoremediation Lab	We will be doing a display of worms in dirt as well as a station where children will have the opportunity to plant a sunflower seed to take home.	**Logan Morris** **Amelie Litalien** **Adrian Pang** **Ellen Mann** **Ryan Bergin** **Eric May**
RMCC Slowpoke-2 Research Reactor	An illustration of the SLOWPOKE-2 Facility, hand on experience using radiation detectors and a game on controlling reactor stability.	**Pavel Samuleev** **Bob Whitehead** **Mohamed Hussein**
Royal Astronomical Society of Canada	Kingston's Astronomy Club, is a local affiliate of the Royal Astronomical Society of Canada, founded in 1961. The members meet monthly, on the 2nd Thursday of each month (September-June), at Ellis Hall Room 324 on University Avenue, Queen's University from 7:00-9:00pm. Sessions include observing sessions, telescope building and all kinds of other related interests. We do public outreach programs in the form of helping the Cubs and Guides, teachers and at public events. We help out our members with questions in astronomy and equipment use, and hold private observing sessions, and also with Queen's University Observatory Open House, on the second Saturday of each month, at Ellis Hall, Queen's University. We are here to answer your questions on astronomy.	**Brian Hunter** **Hank Bartlett** **Paul Winkler** **Rick Wagner** **Susan Gagnon**
St Lawrence College Energy Systems Engineering Technology Program		**Paul Sutterlin** **Gavin Brockway**

ACTIVITIES AND PRESENTATIONS

Who We Are	What You'll Be Doing at Our Station	Volunteers
St. Lawrence College **St Lawrence College Wind Turbine Technician program**	The SLC display items are showcasing renewable energies such as solar and wind as well as using the energy of air in a compressed air demonstration. We also will provide an interactive display that demonstrates temperature measurement and distribution using infrared technology. Participants will also have an opportunity to use human pedal power to generate electricity.	**Aidan Wornes**
St. Lawrence College **St Lawrence College Instrumentation and Control Systems Engineering Technology**	Come discover what dams, heating and cooling systems, wind turbines, and robots all have in common. To help understand what Control Systems are you will have the opportunity to see Smartie, the smartie-sorting robot, in action.	**Julie Cruickshank** **Garrett Sills** **Zena Lauzon** **Fernando** **Zishuo Liu** **Beatriz Hernandez**
KINGSTON **City of Kingston Museums** PUMPHOUSE HISTORY in MOTION **Pump House** MacLachlan WOODWORKING MUSEUM **Maclachlan Woodworking Museum**	How do we get to the other side? No Nails! No Glue! No Ropes! No Problem! Use only wood to construct a self-supporting arch bridge based on the drawing and concept of famous Renaissance artist and inventor Leonardo da Vinci. Challenge yourself to build bridges big and small just like Leonardo! Come catch a glimpse of the City of Kingston museums' exhibition Leonardo da Vinci: relentless curiosity featured this summer at the PumpHouse.	**Paul Robertson** **Tom Riddolls** **Keely Maddock** **Francesca Pang** **Francesca Pang** **Natalie-Josée Carson** **Pamoda Wijekoon** **Caleb Plett** **Joshua Malm** **McKenzie Holbrook** **Melissa Cruise** **Jennifer Campbell**

Who We Are	What You'll Be Doing at Our Station	Volunteers
W.A.F.F.L.E.S. Community Robotics **W.A.F.F.LE.S Community Robotics**	WAFFLES will display our 140 lb robot and Lego FLL field set.	**Sarah Byers** **Aidan Baksh** **Anica Bibic** **Brennan Bibic** **Eden Bibic** **Logan Bibic** **Sarah Byers** **Ryan Cooper** **Duncan Stevenson** **Gavin Stevenson** **Cole Sequillion** **Christine Bibic** **Duncan Mccarron** **Megan Gillespie** **Darryl Gillespie** **Echo Terrell**
Queen's University **Queen's Genetically Engineered Machine QGEM**	Queen's Genetically Engineered Machine Team (QGEM) will be leading interactive workshops to teach about DNA, genetics and cell biology. We will also be explaining some of the work that we do and concepts pertaining to synthetic biology.	**James Colwell** **Ruben Warkentin** **Janis Cheng**

Activities, Experiments, Information, and Resources to Try and Use at Home

ESU
enrichment studies unit
EST. 1987

Grade 7-12 students get The University Experience when they attend any of the exciting programs offered by the Enrichment Studies Unit at Queen's University. Whether they aspire to a career in healthcare, construction, law or law enforcement, technology, the arts, or business... we have the perfect course.

Join Us for Programs in May and August!

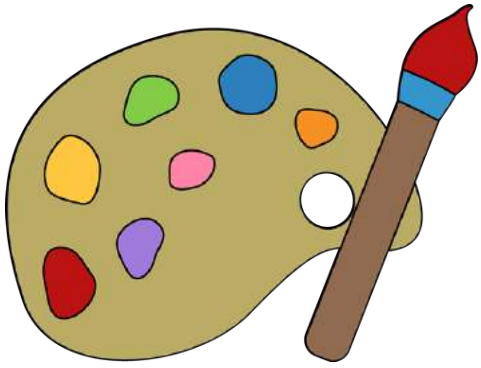
Science Can Be Messy!

Watercolour Science

Make your own watercolour paints

- 4 tbsp baking soda
- 2 tbsp white vinegar
- 1/2 tsp corn syrup for shine
- 2 tbsp cornstarch
- food colouring
- plastic egg carton

In a bowl, mix baking soda and vinegar, then wait for fizzing to stop. Slowly add cornstarch and corn syrup. Mix well. Divide the mixture evenly between the wells of the egg carton. Use a popsicle stick to stir in 6 to 10 drops of food colouring. Stir for 1 minute. Let the paints dry overnight and then they are ready to use.

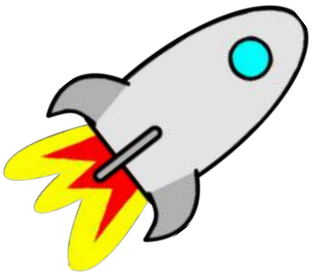


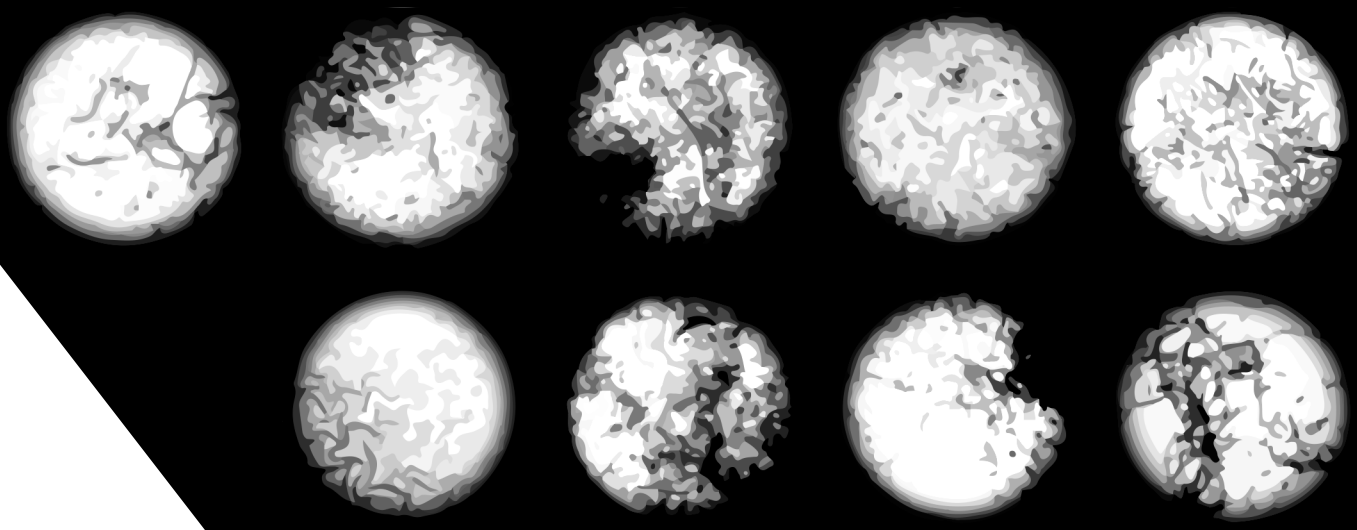
Make it Rain!

You will need a parent for this experiment.

Materials: 1 to 2 litre glass jar with a wide opening, 12 ice cubes, glass or ceramic plate, boiling hot water

Have a parent pour boiling water into the glass jar. Place 12 ice cubes on the plate and place the plate on top of the jar. Completely cover the opening. Watch clouds form and the rain fall.





ART THE SCIENCE

Art the Science is a Canadian not-for-profit organization committed to celebrating the connections between art and science.

BLOG

We **facilitate artist residencies** in scientific research laboratories across Canada.

We **host a knowledge mobilization** platform showcasing Canadian scientific and artistic excellence.

We **chronicle science-art** and its cutting edge creators in Canada and around the world.

GALLERY POLYFIELD

artthescience.com

BRICKS 4 KIDZ CAMPS

LOOKING FOR SOMETHING TO DO OVER A SCHOOL BREAK?

Build amazing memories!

Come join us for a fun filled day of building, learning, and playing using LEGO bricks at a **Bricks 4 Kidz Camp**!

Activities include a technic build using a motor and battery pack, swimming, crafts, and exciting projects with LEGO bricks. Campers have fun stretching their thinking by working cooperatively to tackle challenges, play games and build friendships!

Bricks 4 Kidz School Break Camps available:

Daily Camps

Winter Break
PA Days

Weekly Camps

March Break
Summer Camp

BRICKS 4 KIDZ BIRTHDAYS

GIVE YOUR CHILD A BRICKS 4 KIDZ BIRTHDAY PARTY!

Do you have a birthday coming up?

Celebrate with a fun, interactive, and educational

Bricks 4 Kidz LEGO party!

Host your celebration in a party space at the Boys & Girls Club of Kingston. Guests will engage in a cooperative build using a motor and battery pack, followed by LEGO themed activities, and time to enjoy food and gifts.

Party **Add-ons** and **Specialized Themes** available:

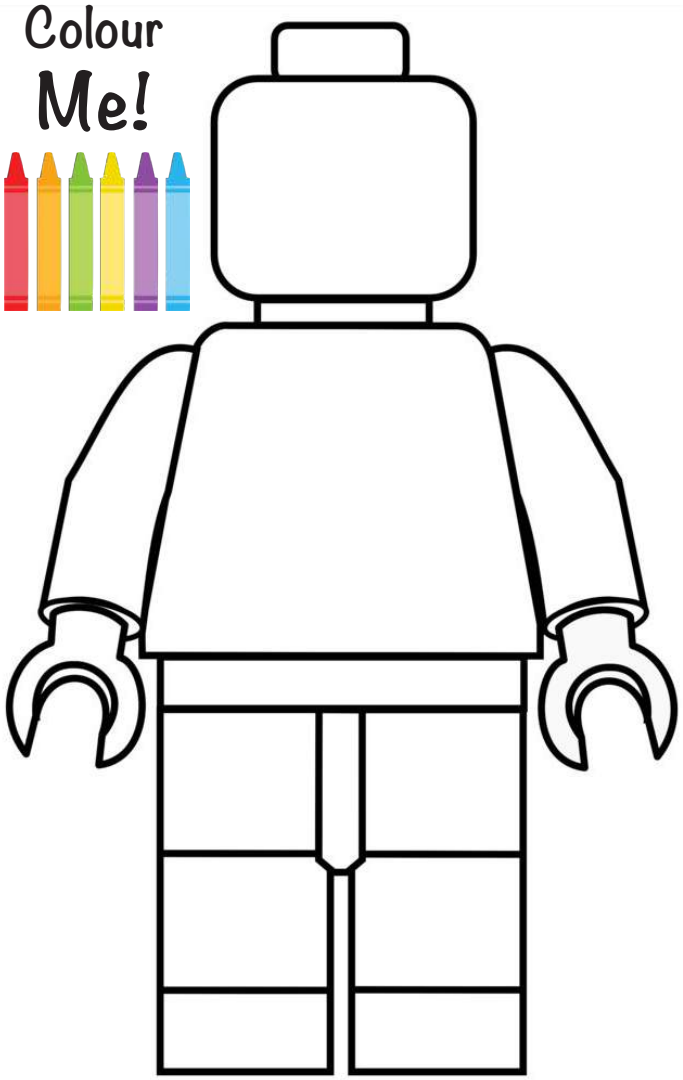
Party Add-ons:

Angry Birdies • Mining & Crafting • Mini Figure Factory

Party Themes:

Superhero • Space • Pirates
Planes, Trains & Automobiles • Arts & Crafts

Colour Me!



Word Search

HARLEY QUINN
JOKESTER
LOW RIDER
MOTORCYCLE
RIDDLES
SUPER SIDEKICK
BAT HERO
BAT JET
BAT SIGNAL
BAT VEHICLE
CAT GIRL
GRAPPLING HOOK

S U P E R S I D E K I C K H R Y
R X L U U Q B P R Q N F G A E T
N O D E L R I G T A C R T R D B
B A T V E H I C L E A E L L I W
M W O P H Z B I F P J A R E R W
R O X R O D L K P T N W I Y W W
N R T W E S N L A G R F D Q O B
E P S O J H I B I Z E C D U L Q
N Z B D R N T S C C T G L I F I
P K Y T G C T A R Q S K E N I C
B J X H H A Y Y B L E P S N Q U
O T O Y B S N C A F K H Y N Q L
K O Q Y Q U U U L J O Z K R U R
K J U V R M L D B E J K M V B S
A X S E Q M F I J T E K M O I H
D E J X H A E U D C B X P J O U

bricks 4 kidz
we learn, we build, we play with LEGO® Bricks

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Boys and Girls Club of Kingston & Area

Fractals in Nature and on Computers

Fractals are patterns that are repeated over and over on different scales in a similar, but slightly different way. You can find them in nature or you can make them yourself, for instance on a computer. Once you start looking for them, you can find fractals everywhere:


Plants


Animals


Rivers


Lightning


Snowflakes


Vegetables

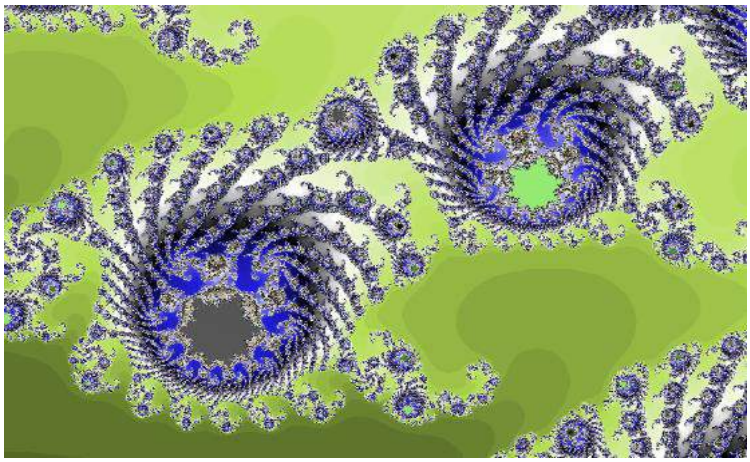
The last picture is the surface of a "**Romanesco Broccoli**". Don't forget to pick up **a few seeds** for these, together with **a peat pellet** at our booth.

- Place **three or four seeds** into the dimple on the pellet.
- Fill an under **cup with water** and place the pellet with the seed into it. It will expand a lot.
- **Water** every day and wait until the plants to sprout, about a week.
- When they've grown, transfer to a **flower pot**, and later outside.

They will grow **broccoli heads** with a beautiful **fractal pattern**. Finally, cook and eat with cheese sauce.

You can make stunning fractal pictures on the computer.
The **computer program XaOS**, similar to the one at our booth will run on your parents' computer.
Download at https://fractalfoundation.org/resources/fractal-software/

You can make patterns like this:

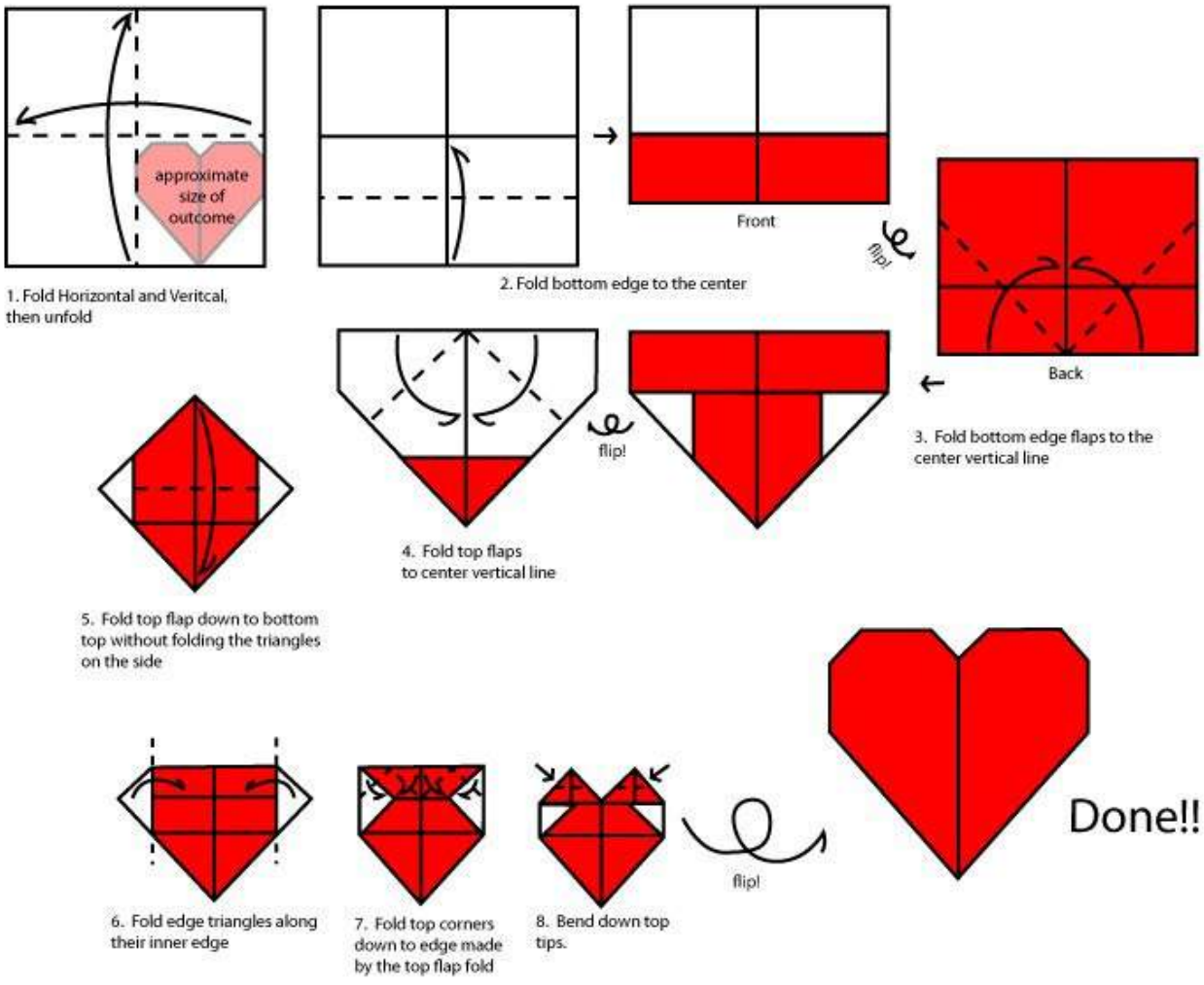


You can change the colors and zoom in and out. You can also change the way the picture is calculated, and if you are a math wiz you can even come up with your own formula. You may need the help of your parents, but that is what they are for, right?

Origami Heart Instruction sheet provided by...

Queen's University

Cardiovascular Imaging Network
Queen's



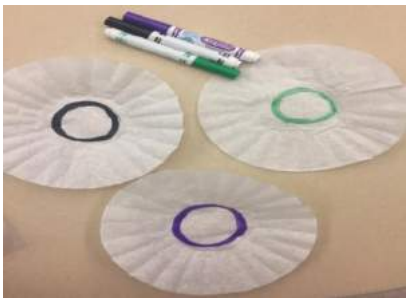
Colour Chromatography Butterflies!

Background

Have you ever wondered how different **colours** are made? The colours that you see are actually made up of lots of different colour **molecules** all mixed together! As you go through the experiment, you will get to see all the different mixtures of colours that make up the colours you see every day!

Materials

- Small bowls or cups
- Water
- Coffee filters
- Coloured water-soluble markers
- Water-soluble black markers
- Paper towels
- Plates or a plastic bag
- Pipe-cleaners



Safety Considerations

Make sure you clean up any water spills!!

Procedure

1. Fill one cup a ¼ the way full with water for each butterfly you are making.
2. Take a coffee filter and draw several circles using a black (or dark coloured) marker.
3. Fold or bend the coffee filter into a cone and place the tip of the cone into the cup of water.
4. Watch and see what happens to the black marker!

5. Try this again with different coloured markers and see what happens!
6. Once the water has travelled through the entire coffee filter, take them out of the water and lay them to dry on a plate or plastic bag.
7. Once the coffee filters are dry, pinch them in the middle and wrap the pipe cleaner around this spot.
8. You can shape the ends of the pipe cleaner so that the butterfly has antennae!
9. For more fun, you can try the experiment with different types of paper and see how this affects what you see!

FAQ

What is happening when you put the coffee filter into the water?

The colours in markers are made up of lots of different colour molecules (very, very small particles) and when the coffee filter **absorbs** the liquid, these molecules are **dissolved** into the water. Depending on how big they are, the molecules move at different speeds which is why you see the colours separating.

Why am I seeing different colours appearing on the coffee filter?

The colour that you see when you colour with a marker is made out of lots of different colours mixed together! When the colour in the marker is exposed to water, it is able to separate into the colours that were used to make it!

About Science Quest

Science Quest is a STEM organization located in Kingston that strives to inspire youth in science, technology, engineering, and math! We run classroom workshops for SK-8 in May and June, summer camp in July and August at Queen's University for JK- grade 8, and school year clubs during the school year for grades 4-8.

Be sure to check out www.sciencequst.ca for more information on Science Quest's programs.

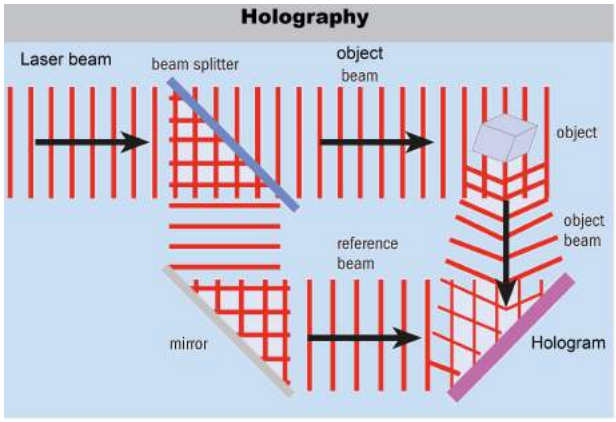
Holography

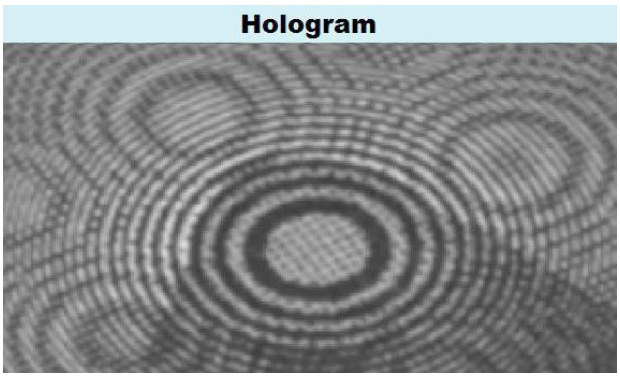
Have you heard about holography? do you know **What is holography?** Holography is the science of recording three-dimensional (3D) image of an object, and the media in which the image is encoded is called hologram.

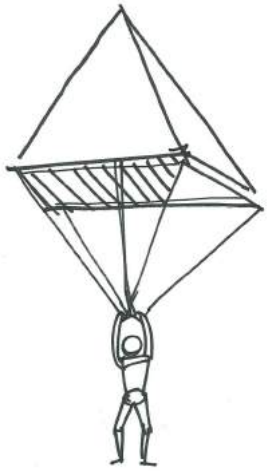
What is difference between a photo captured by a regular camera and a hologram? Camera pictures are two-dimensional (2D); a flat image of front view of an object. You cannot see the depth or different sides of the object in a flat image once it is captured.We all are 3D creatures, it means that we have width, length and depth. When you look at your friend's face, if you walk around him, you can see different sides of his head. But once you capture a photo of his face, you would just see his face. Holography gives us the ability to record 3D image.

Now the question is **How the hologram is made?** For making a hologram we need **laser** light. So, first let's see what is difference between laser and usual light? Have you ever seen a parade of soldiers? Every soldier is moving at a specific distance from another one and they move with constant speed in same direction. That makes the parade look so aligned and ordered. Well, Laser light looks like a parade. In fact, light is made of small soldiers called photons. In laser, photons move aligned and ordered, but in usual light they move randomly. In photography, object is shined with usual light and the reflected light captured on a material which is sensitive to the intensity of the light. Depending on the amount of light that each point of the light sensitive material gets, the color of that point will change. However in holography, as I said we need laser light. In a typical arrangement, the laser beam split into two beams, object beam and reference beam. The object beam illuminate the object and the scattered light from the object is focused onto the holographic plate. Whereas, the reference beam is focused directly onto the hologram. The two beams would then interfere on the surface of the hologram and produce an interference pattern on it. This pattern gives us information about distance that each light originates from the object, because the path of the object beam is compared with respect to the reference beam. Hence, not only the intensity of the reflected light get stored but also the path difference of each ray also get stored. This give information about the depth of the object.

How to observe a hologram? If you look at the hologram, you will not be able to see the image itself. You will just see the interference pattern, like the one in the figure below. It looks like the wave patterns on a lake. Throw two stones at the same time into a quiet lake, and you will see how the emerging circular waves will eventually overlap and create an interference pattern. To see the hologram made, we need to use a similar laser. Recently, another kind of hologram is made where one can see the image with usual light, but you need to look at them at certain angle.



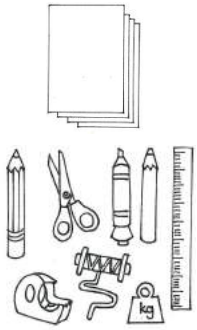




Oh, Chute!

IT'S A DA VINCI PARACHUTE!

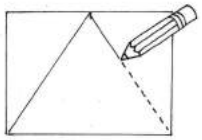
YOU NEED



- 4 pieces of thick paper (8.5 X 11)
- Pencil
- Ruler
- Scissors
- Pencil Crayons
- Tape
- String
- A small weight (paperclips, a washer or a small action figure work well!)

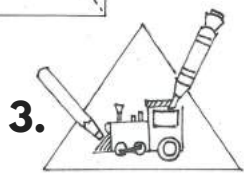
HOW TO MAKE

1. Take a piece of paper. Mark the middle on the widest side. Draw a line from the middle mark to the bottom corners to make a triangle. Repeat on each sheet of paper.



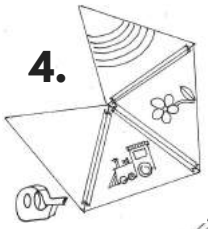
2. Cut out the triangles. You should have four triangles.

3. Decorate your triangles.

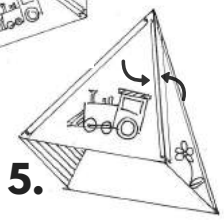


4. Place your triangles side-by-side. It will look like a pentagon with one open side. Tape each section where the sides meet together.

5. When you come to the last pieces, fold your shape so it becomes a pyramid. Tape the last two sides together.

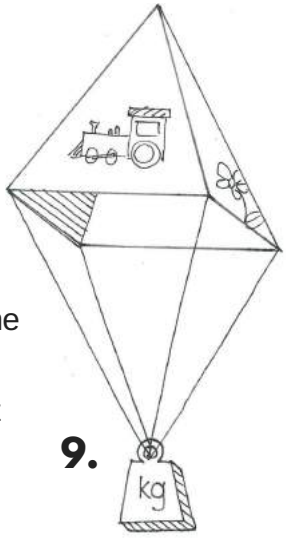


6. Cut four pieces of string. Each piece should be 40 cms.



7. Tape a piece of string to each bottom corner of your parachute.

8. Tie your weight to the string. Keep the length of each string the same.



9. Test your parachute! Find somewhere high and safe to drop your parachute. **What happens?**

DISCOVER

LEONARDO DA VINCI: RELENTLESS CURIOSITY

AT THE PUMPHOUSE NOW - FALL 2018

PUMP HOUSE
HISTORY in MOTION

MacLachlan
WOODWORKING MUSEUM

KINGSTON

THE DEPARTMENT OF CIVIL ENGINEERING

AT THE ROYAL MILITARY COLLEGE

Make your own Archimedes Screw Pump

The Archimedes screw is made up of a hollow cylinder and a cylindrical core. Helical blades are wound around the core and secured tightly against the hollow cylinder. The helical blades create pockets between the core and the inner wall of the hollow cylinder. To move water the screw is rotated and it scoops up a small amount of water into the first pocket. With each turn of the screw, the pocket of water moves to the next pocket, and a new scoop of water enters the first pocket. This motion continues until the first scoop of water comes out at the other end. The Archimedes screw is used to transport water from low-lying areas to higher areas. The design is so effective that it is still being used in many modern-day applications. For instance, it is used to lift wastewater in treatment plants because it works well with varying rates of flow and with suspended solids of found in wastewater.

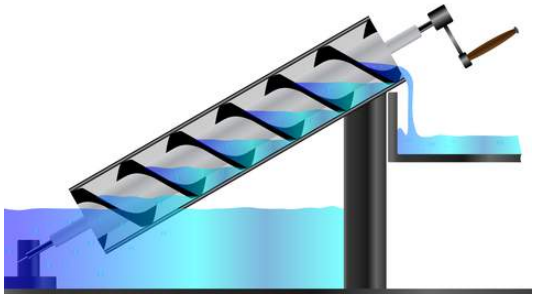


Figure 1: Inside view of Archimedes screw pump. (http://empoweringpumps.com/screw-pump-basics/)

Supplies

- Cylindrical dowel or tube, ½-inch diameter, 2-foot length
- Clear vinyl tubing, 10-foot length, with a 3/8-inch outer diameter x ¼-inch inner diameter
- Gorilla tape or duct tape
- Permanent marker
- Strong scissors
- Lab notebook
- Liquid measuring cup
- Spoon
- Water
- Food coloring
- 2 plastic bowls, 12-oz
- Tape
- Pen
- Books or plywood board of various thickness (1-2)

Instructions

1. Using the cylindrical dowel and the ¼-inch-inner-diameter vinyl tubing, take a piece of strong tape and tape one end of the tubing to the outside of one end of the dowel such that a ¼-inch length of tubing is hanging off the end.
2. Carefully wrap the tubing around the dowel in regular intervals until you come to the other end of the dowel leaving a ¼ inch to hang off of the end. Cut the tubing with scissors and tape it down with pieces of strong tape along the dowel. There should be a ¼-inch of tubing hanging off both ends of the dowel, past the sections that you taped down.
3. Tape one bowl to the table and place the other bowl on the book or plywood about 2 feet away from the bowl taped to the table. Pour the 1 cup of water into the bowl on the table and dye it with food colouring.

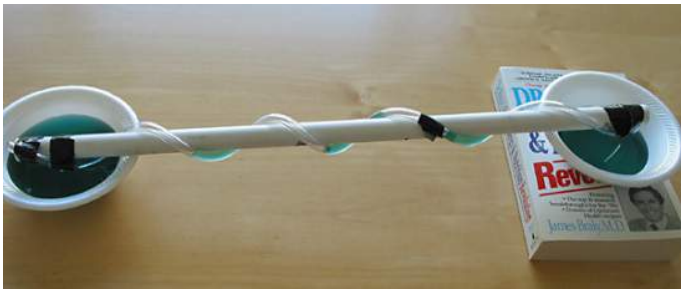


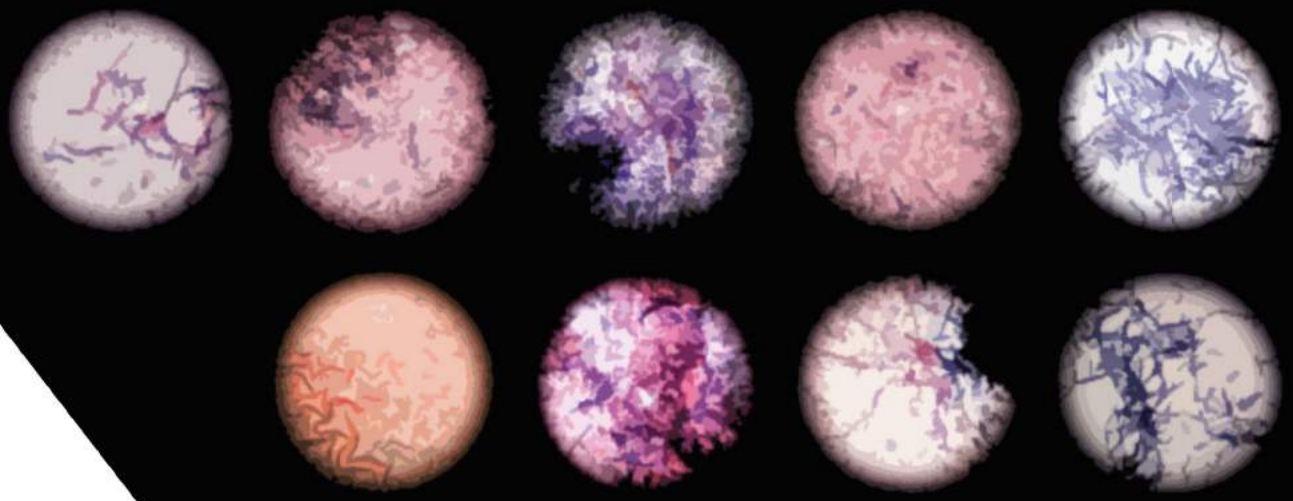
Figure 2: Modified Screw pump

4. Place your Archimedes screw across the two bowls, as shown in Figure 2. Be sure the extra ¼ inch of tubing hanging off the end is in the bowl of water on the table. Turn the screw so that every time the end of the tube goes into the water it scoops up some of the water. You may need to adjust the angle of the tubing.
5. Tilt the screw so that one end is in the water and the other end is above the second bowl.
6. Make sure that as you turn the screw, the water doesn't fall back out of the screw. If the water does fall out, adjust the tilt of the screw, the placement of the bowls, and/or the height of the discharge bowl. Use an extra book or board if needed.
7. Turn the screw a few times to make sure that the water is traveling through the tubing. Have fun moving water from the lower bowl to the higher bowl. You can measure the vol

Reference:
Science Buddies Staff. (2017, November 11). It's All in the Wrist: Moving Water with the Archimedes Screw Pump. Retrieved March 1, 2018 from https://www.sciencebuddies.org/science-fair-projects/project-ideas/ApMech_p039/mechanical-engineering/build-archimedes-screw-pump

TRUTH • DUTY • VALOUR

VÉRITÉ • DEVOIR • VAILLANCE



ART THE SCIENCE

BLOG

Art the Science is a Canadian not-for-profit organization committed to celebrating the connections between art and science.

We **facilitate artist residencies** in scientific research laboratories across Canada.

We **host a knowledge mobilization** platform showcasing Canadian scientific and artistic excellence.

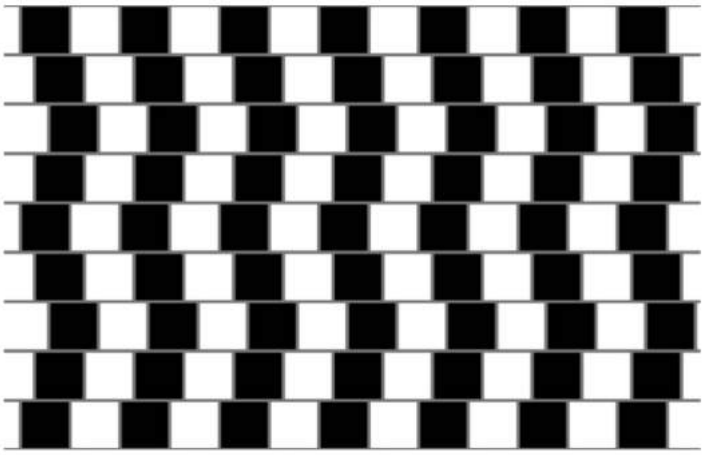
We **chronicle science-art** and its cutting edge creators in Canada and around the world.

POLYFIELD GALLERY

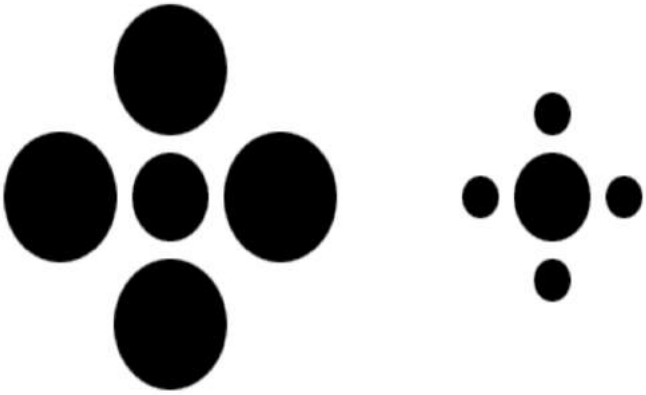
artthescience.com

Let's Talk: Optical Illusions

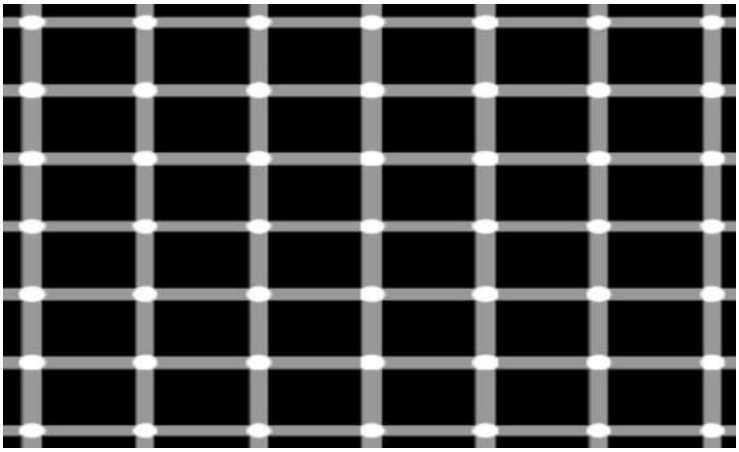
Optical illusions are images that aren't what they seem, and the world is full of them! When your brain tries to make sense of the things you see, it is mostly successful in figuring out reality. However, sometimes your brain has to "fill in the gaps" to interpret things it cannot process. This can sometimes cause us to see images that aren't actually there. Based on neuroscientific and psychological principles on how our brains perceive different shapes and colors, these images use your eyes to TRICK your brain! Pretty sneaky!



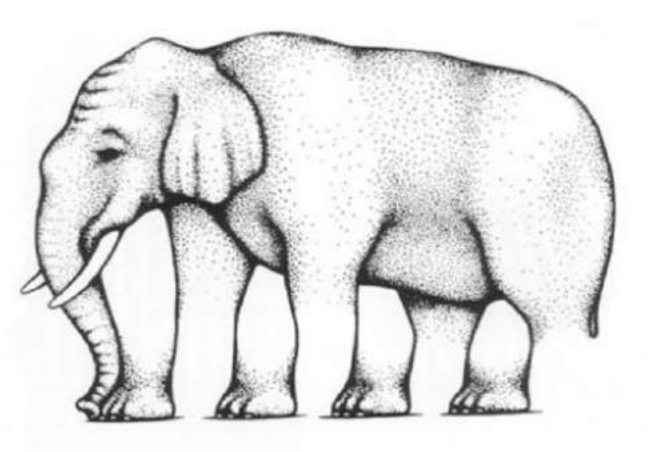
Are these lines straight or bent? This optical illusion is called the "Café Wall Illusion" and, despite what you see, it made up of entirely straight parallel lines!



Look at the dots in the center. Which one is bigger? Would you believe it if I told you the dots were the same size?



Do you see black dots appearing and then disappearing all over the grid? This phenomenon hasn't fully been explained by science yet.



This elephant is missing a leg…or is it? The artist confuses the viewer by changing the way our brain is used to seeing things.

MILITARY COMMUNICATIONS & ELECTRONICS MUSEUM

MUSÉE DE L'ÉLECTRONIQUE ET DES COMMUNICATIONS MILITAIRES

MORSE CODE RECEIVER/SENDER PROJECT

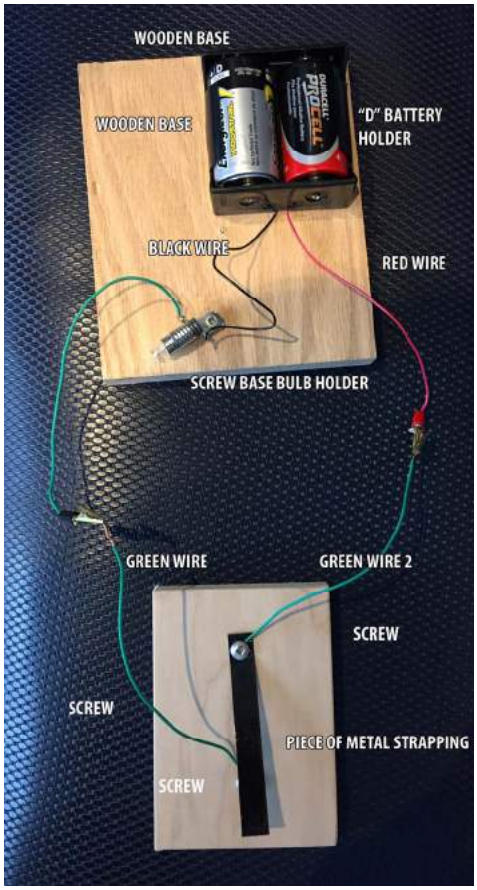
Ask an adult to help with this project!

Required Materials:

- A screwdriver
- 3 screws
- Wooden base for your receiver (12 cm x 15 cm x 2 cm recommended)
- A Solder Iron
- Solder
- Wire strippers or scissors
- Sandpaper (to smooth the edges of the base)
- "D" Battery Holder (with colour-coded wire leads)
- 2 Micro Clips (insulated Barrel type with solder connections) [1 black; 1 Red]
- Screw-Base Lamps (light bulb) #14
- Screw-Base Lamp Holder (bracket)
- 1 piece of Hook up Wire (22 Gauge Stranded) with stripped ends (length varies)
- 2 D-size Batteries

Instructions: (See Pictures)

1. Measure & cut the wooden base for your receiver (sand edges as necessary)
2. Attach the Battery Case to the Wooden Base, using 2 screws (you could use more but it's not necessary).
3. Attach the Screw-Base Lamp Holder, with the remaining screw, to the wooden base.
4. Screw in the light bulb into the holder.
5. Strip, using wire strippers, approximately 1-2 cm off the end of the black wire (coming out of the battery holder); attach it to one of the metal loops on the Screw-Base Lamp holder. Solder it for extra security if desired.
6. Strip approximately 2 cm off the red wire (also coming out of the battery holder); poke it through the base of the red micro clip and wrap it tightly around the metal portion of the clip. Solder it in place for added security if desired.
7. Cut a piece of hook-up wire to desired length, stripping 1 -2 cm off of each end. Attach one end to the other metal loop on the Screw-Base Lamp holder. Solder it for extra security if desired. Poke the other end through the base of the black micro clip and wrap it tightly around the metal portion of the clip. Solder it in place for added security if desired.
8. Insert "D" batteries into the holder.



MATERIALS CAN BE FOUND AT:

LEADING EDGE HOBBIES

ONE-CONDUCTOR STRANDED HOOK-UP WIRE #

BATTERY HOLDER
Battery holder, holds 2 D batteries, with wire leads.

1 3/8" MICRO TEST CLIPS
1 3/8" micro test clips. 8 per pack: 4 red, 4 black. brass-plated.

LAMP (#14)
Lamp: 14 Volts: 2.47, mA: 300, Bulb: G-31/2, Base Size: 11.1mm threaded

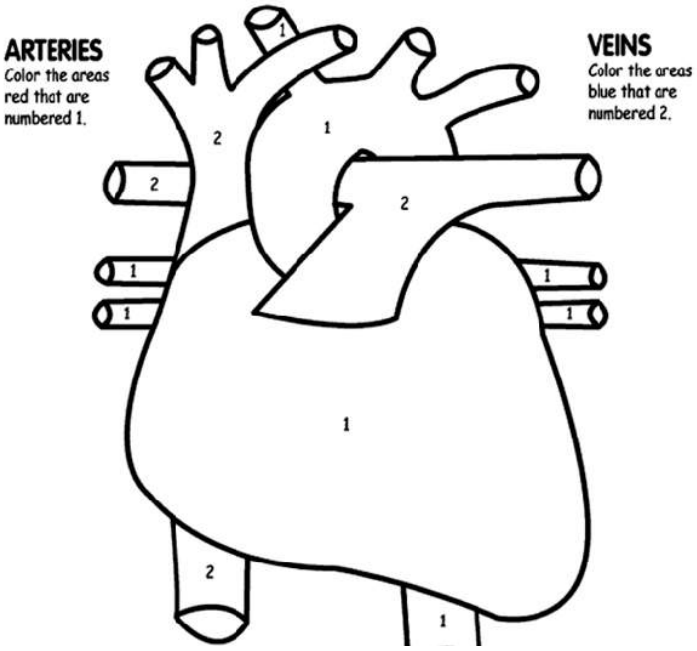
LAMP HOLDER
Lamp holder: Fits E-10. Threaded bulbs

D Batteries

BRASS STRIP OR METAL STRAPPING FOR KEY

BALSA WOOD

PUMP IT UP!
YOUR HEART & BLOOD!



Your heart is made up of <u>two</u> different types of blood vessels:

Arteries: blood vessels that deliver oxygen-rich blood from the heart to the rest of the body.

Veins: blood vessels that carry oxygen-poor blood to the heart.

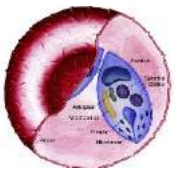
Follow the directions and colour this heart!

In one tiny droplet of blood, there is approximately 5 million red blood cells!

The Circulatory System also includes your blood!
Can you match the three types of cells in the blood to their description?

Red Blood Cells deliver oxygen from your lungs to your tissues and organs. They look like tiny disc-shaped cells. They are hemoglobin in them, which helps carry oxygen and gives the cells their red colour. Life: 4 months.

White Blood Cells are a basic part of the immune system. They produce antibodies, which defend against bacteria and viruses. Some live less than a day, but others can live longer.



Platelets help blood to clot when you have a cut or wound. They are also called thrombocytes, and are tiny fragments of large bone marrow cells. Life: 6 days

Bringing Canada's healthcare story to life!

Ann Baillie Building National Historic Site
32 George Street, Kingston, ON K7L 2V7
Phone: **(613) 548-2419** ● **www.museumofhealthcare.ca**

Museum of Health Care at Kingston

Heart&Stroke™

Connect the Acronym/Pictures on the Left to the Descriptions on the Right

Face

Arms

Speech

Time

is it slurred or jumbled?

to call 9-1-1 right away.

can you raise both?

is it drooping?

Shortness of Breath

Upper Body Discomfort

Sweating

Chest Discomfort

Nausea

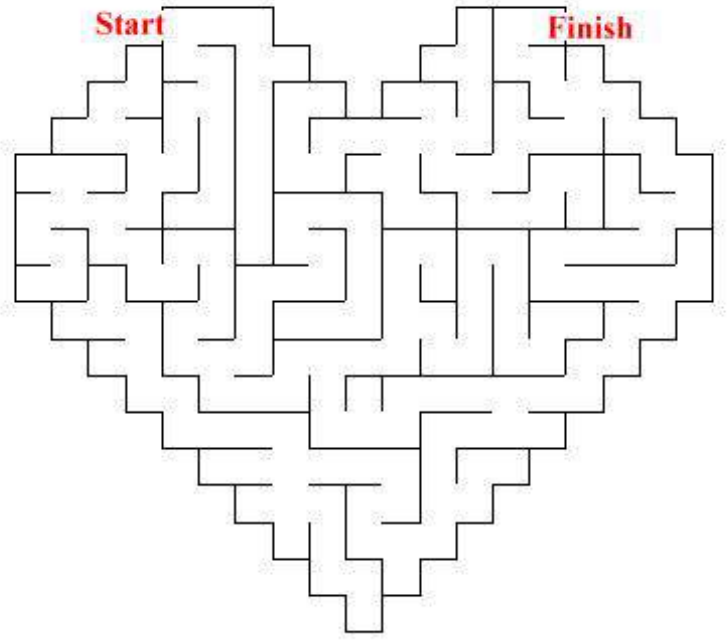
Light-headedness

Get your steps! Kids should accumulate about 12,000 steps a day to maintain healthy physical activity levels. How many steps can you get in your 15 Move It Minutes?

Track your steps with a pedometer available at our Science Rendezvous booth!

Write in your steps achieved	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
15 Move It Minutes							
15 Move It Minutes							
15 Move It Minutes							
15 Move It Minutes							
Colour in the Heart once you've reached 1 hour!							

Your heart is a-MAZE-ing!



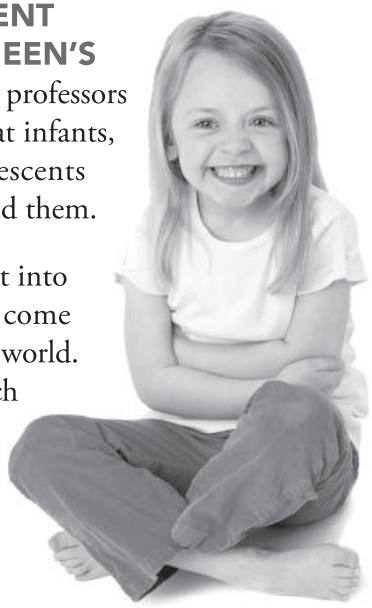
How to Be Good To Your Heart!

1. Hydrate with water.
2. Fuel with fruits and veggies.
3. Turn off your screen and get active.
4. Eat fewer "junk" snacks and select healthier alternatives.
5. Get active every day for at least 1 hour.

CHILD and ADOLESCENT DEVELOPMENT
Queen's University

CHILD AND ADOLESCENT DEVELOPMENT AT QUEEN'S

We are team of students and professors interested in finding out what infants, toddlers, children and adolescents know about the world around them.



Our research provides insight into how people grow, learn and come to interact successfully in the world. The findings from our research have important implications for how best to educate children and how to help children with special needs.

HOW DO I PARTICIPATE?

- Contact us to make an appointment.
- Come to Queen's University to participate in our fun and interactive studies.
- Parking is provided and siblings are always welcome.

CONTACT US:

Department of Psychology
Humphrey and Craine Halls
Queen's University
62 Arch Street, Kingston, ON K7L 3N6

Queen's University

613-533-2476
child.studies@queensu.ca
www.queensu.ca/psychology/developmental-participate

Like us on Facebook for updates and study results! **(search for Child and Adolescent Development)**

613.533.2476
child.studies@queensu.ca
Twitter: @QueensChildDev

SCIENCE AT HOME

Think like a scientist!

Scientists ask questions: *What happens when…? Why does….? How does…?*

Scientists make predictions: *I predict that… I think that…*

As scientists, we test our predictions by doing careful experiments and making observations. Coming up with a good experiment is sometimes hard, but you can get better with practice!

These two games give our scientific reasoning a workout. See how well you do! For each game, you will need a friend, parent, brother, sister…anyone!

WHICH GLASS HAS MORE?
(good for parents with young children)

Materials Needed

- At least two clear drinking glasses, one short and wide, and one tall and skinny
- Water or another liquid

Instructions

(1) When your child isn't looking, fill up each glass with the same amount of liquid.

(2) Ask your child, "Which glass has more or do they have the same?" [Often, very young children will be fooled and think that the taller glass has more liquid. This is ok! Regardless of how they answer, it gives an opportunity to test their predictions.]

(3) Now ask, "How can we test whether one glass has more?"

CAN YOU BREAK THE CODE?
(good for older children)

Materials Needed

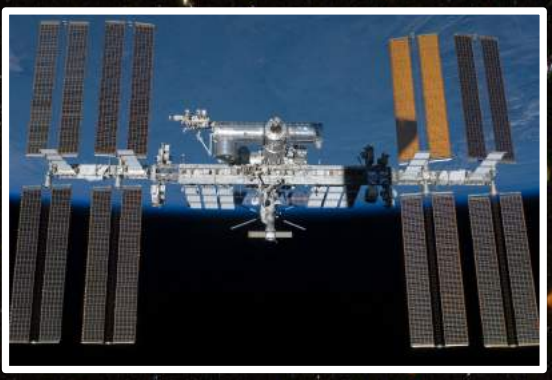
- The game 'Mastermind'. (http://www.archimedes-lab.org/mastermind.html)

Instructions

In a game like Mastermind, you to make a prediction, test it, and observe whether you were correct – just like a scientist. One player (the code-breaker) has to figure out the secret code chosen by another player (the code-maker). The code-breaker has to make a series of guesses based on feedback given by the code-maker. Try playing a few rounds!

Royal Military College of Canada

Department of Physics and Space Science



The International Space Station (ISS) is an artificial satellite with astronauts onboard. You can see it zoom across the sky from your own backyard!

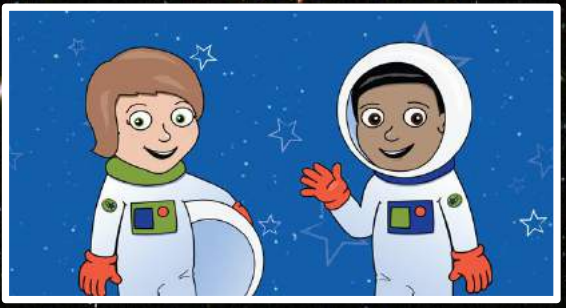
Go to https://spotthestation.nasa.gov/ to know when the Space Station will be overhead in your area.

Night Sky apps can help you learn about the sky. You can identify planets, stars and constellations!

Point your phone at a celestial body and the app will tell you what you're looking at.

Android

iPhone



Visit the Canadian Space Agency's website for some fun activities that you can do at home:

http://www.asc-csa.gc.ca/eng/activities/fun-experiments/default.asp

You can make a spacesuit, rockets, or even your own slime!

Images from NASA, CSA

How Does a Reactor Work?

Nuclear power reactors are used to generate the electricity that runs our homes, our factories, and our businesses. It's even used for some ships and submarines!

Fission of uranium atoms occurs in the reactor vessel. The heat that is generated is extracted in a two-step process and is used to produce steam. The steam that is generated flows to a turbine, which in turns drives a generator that produces electricity.

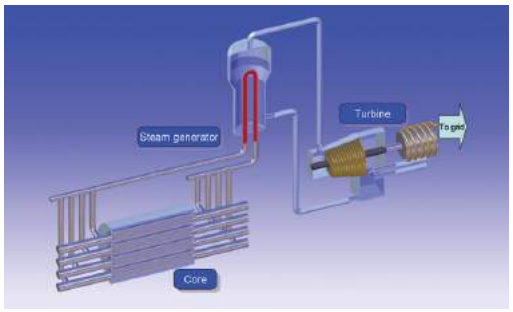


Image Source: Ali El-Jaby

CANDU reactors use natural uranium and have several layers of defense-in-depth that make the design unique. Worldwide, we get about 14% of our electricity from nuclear. In Ontario, it's over 50%!

Not Just about Energy

The DNA Dosimeter

Something that everyone in the nuclear power industry has to wear is a dosimeter, which measures the amount of radiation a person gets. This is one of the many safeguards in place to keep workers safe.

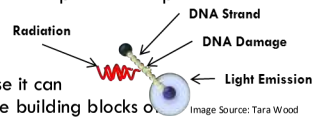


Image Source: Tara Wood

The reason radiation can be harmful is because it can damage DNA, the building blocks of life. A clever idea, however, is to use this damage as a way to measure how much radiation dose a person receives. Researchers have designed a detector made up of synthetic DNA which emits light when the DNA is damaged. The amount of light emitted tells us how much dose was received.

Space Radiation

Space radiation from the Sun (solar flares), from deep space, and trapped within the Van Allen belts make for an extreme environment that impacts orbiting satellites, astronauts on-board the International Space Station, and even airline pilots travelling between continents. Part of the research being done at RMC is to model the amount of radiation astronauts receive and also, to figure out how solar flares travel through the atmosphere and impact pilots. This is being done so that whether a pilot is flying to Paris, or an astronaut is orbiting Earth, both can stay safe!


Image Source: Wikimedia Commons

Making Jet Planes Safer!

Neutrons can be used to take images of the internal components of materials like aircraft wings. Just like taking an x-ray, neutrons can penetrate objects, and we can get images of the internal structure of objects. This technique is being used to maintain Canada's fleet of CF-18 jet fighters by finding corrosion and water ingress before serious damage is allowed. to occur.


Image Source: RCAF

Staying Prepared

Safety is taken very seriously in the nuclear power industry. Workers, engineers, and scientists are constantly on the lookout for problems, always trying to improve engineered safety and prevent accidents. But if an accident does happen, and if all of the containment barriers are breeched, radioactive material can spread through the air. By modeling this, we can better predict what areas will become affected, and take measures to ensure that the public is kept safe. Last year during the accident at the Fukushima Daiichi nuclear power plant, atmospheric dispersion models were used to predict where radioactivity would spread. This helped the response teams decide what areas needed to be evacuated.

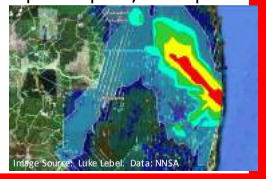


Image Source: Luke Lebel. Data: NNSA

Royal Military College of Canada

Nuclear Engineering

What We Do

Nuclear engineering means harnessing the power that's contained within the atom for the purpose of generating electricity, and powering our society. It means building, operating, and maintaining the reactors that we use to extract nuclear energy. More than power generation, nuclear engineering has applications in material science, radiation safety and medicine. At RMC, we model the performance of nuclear fuel, research radiation exposure in airplanes and spacecraft, investigate atmospheric dispersion, and design the next generation of reactors.

Oodles of Elements

There are 118 elements on the periodic table. The elements are the building blocks of matter, and everything around us and everything that we're made of is made out of them. At their heart, there is a tiny nucleus composed protons and neutrons.

Hydrogen, the lightest of all elements, is made out of only a single proton. Helium, the next lightest, has two protons and two neutrons. Heavier and heavier elements can be made simply by adding more protons and neutrons, and we get the wonderful variety of elements, from oxygen, to iron, to gold, to plutonium.

But there's a limit: the more protons and neutrons you cram in, the harder it is to keep them all together. Eventually, if you add even one more, the whole nucleus will break apart.

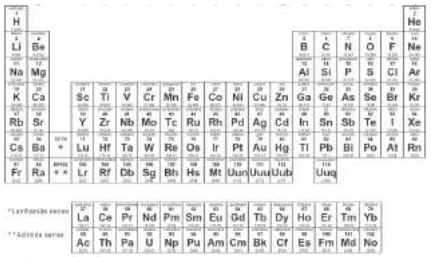


Image Source: Wikimedia Commons

Fission and the Chain Reaction!

You can picture the nucleus of a large atom like uranium as an unstable droplet of liquid. When hit by a neutron, the nucleus splits in half. The two parts fly off with great speed and great energy. You get 4 million times more energy for a gram of uranium than you do from a gram of gasoline.

But more than this, when you split uranium with a neutron, you get more neutrons. These neutrons go on to cause more fission in fresh uranium atoms in a chain reaction. The power from nuclear reactors is adjusted by controlling the number of free neutrons, so that for every fission, you get exactly one neutron to maintain the reactivity.

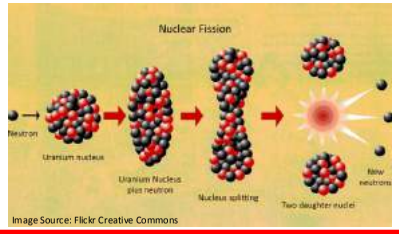
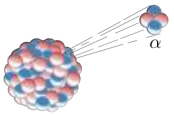


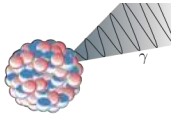
Image Source: Flickr Creative Commons

Types of Radiation



Alpha Particle, α
These are 2 protons and 2 neutrons bound together. They're ejected from heavy radioactive elements. They're very energetic, but can't penetrate very far!

Beta Particle, β
These are high energy electrons or positrons (anti-elections) that are ejected from the nucleus of a radioactive atom. Beta particles can be found in bananas!



Gamma Photon, γ
An electromagnetic wave (photon) emitted from the nucleus of an atom. It's able to travel through many materials and is used to treat cancers!

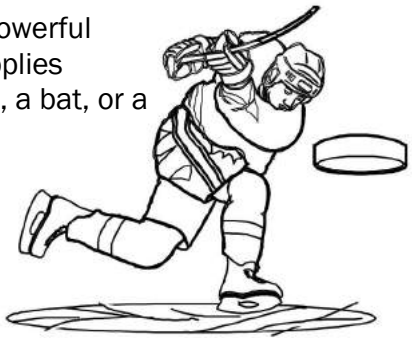
Image Source: Wikimedia Commons

SPORT BIOMECHANICS

WITH THE QUEEN'S BIOMECHANICS AND ERGONOMICS LAB!

Badminton players can move their arms quickly to impact the ball during a serve. To see how **fast** they move their **racquet**, we can use a sensor to measure the **speed** of their swing

Hockey players **chase** the puck across the ice. Their **goal** is to put the **puck** in the net. They apply a large **torque** (a turning force) to **swing** their stick, generating a powerful slapshot. This same principle applies whether you are swinging a **club**, a bat, or a racquet.



Basketball players **jump** to dunk the ball. The higher they jump, the longer they can stay in the air, but **gravity** ultimately pulls them back down to the ground.

High jumpers, push off the ground to get over the bar. Once over the bar, they **land** on a soft mat that absorbs the force of the **impact** with the ground so that they do not get hurt.

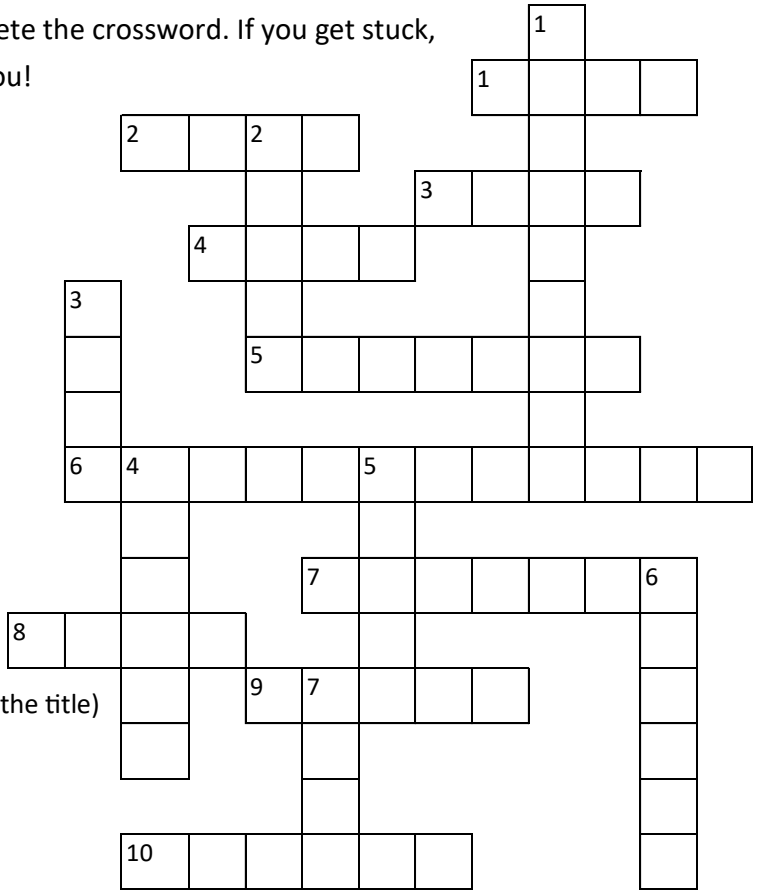
CROSSWORD: Use the clues below to complete the crossword. If you get stuck, you can use the bolded words above to help you!

Down Words

1 A sport played with a birdie
2 You _____ a bat, club, racquet, or stick
3 A golfer needs a _____
4 Hit
5 Run and try to catch / Pursue
6 A turning force
7 A hard rubber disk

Across Words

1 Touch down from a jump
2 Not slow
3 Propel oneself into the air
4 Not low / A type of jump
5 The pull of the earth
6 The mechanics of biological systems (see the title)
7 Needed in tennis/badminton/squash
8 A point in hockey
9 Hurry / race / zip / haste
10 Canada's game

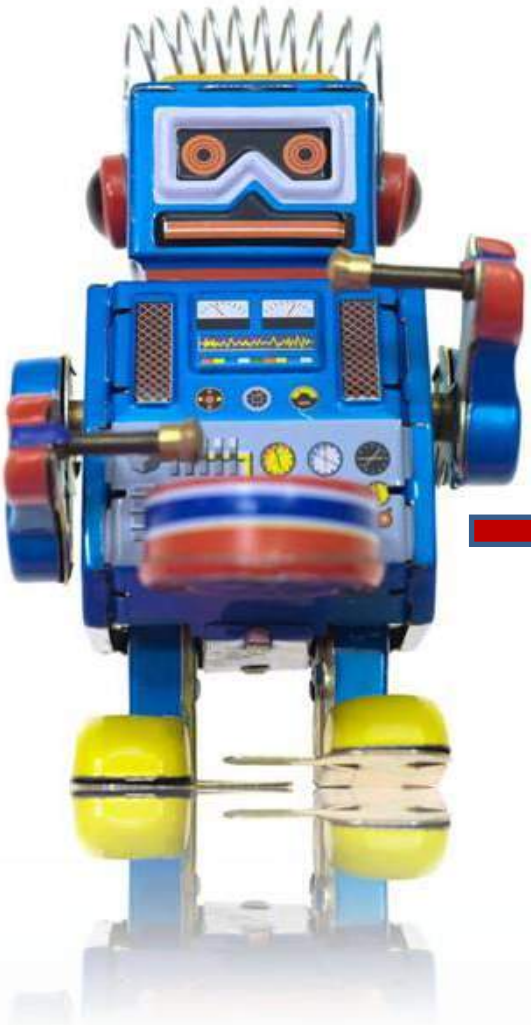


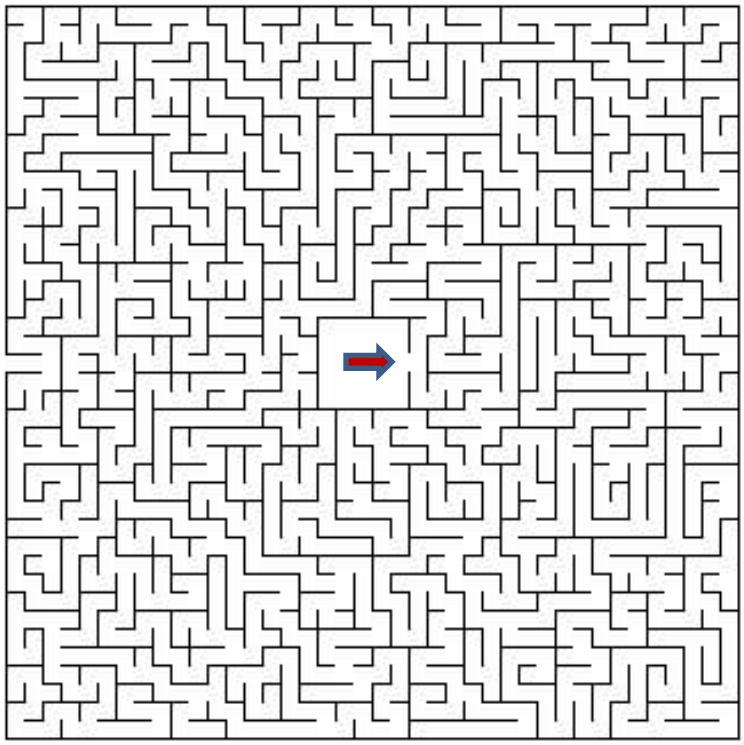
Royal Military College
Military Psychology and Leadership Department

Artificial Intelligence: computer systems that are able to replicate human patterns of cognition, decision-making, speech, calculations, and judgement

Psychology studies the factors that determine people's thoughts and behaviours.

Robots help with this process; when we learn how to develop artificial intelligence platforms, we learn about ourselves!





The Optical Society
Queen's Student Chapter presents:

The Scientific Art of HOLOGRAPHY

Optics and photonics are sub-fields of physics that have a profound effect on our daily lives. We can thank optics and photonics for fiber-optic high-speed internet, a host of medical imaging techniques, many components in smartphones and digital cameras, & more! The Optical Society (OSA) has been the world's leading champion for optics and photonics for over 100 years, uniting and educating scientists, engineers, educators, technicians and business leaders worldwide to foster and promote technical and professional development. The Queen's OSA Student Chapter can be reached at ***<queensuniversity@osachapter.org>***; please feel free to contact us if you have any questions about the OSA, our booth at Science Rendezvous, the fun experiment below, or optics in general.

Try this at home!

Experiment: *Bending Light*

Required time: ≤10 minutes
Source: <https://www.optics4kids.org/>

Material checklist:

- ○ Utility / Exacto knife
- ○ Clear cylindrical drinking glass
- ○ Water
- ○ Scotch tape
- ○ A piece of colored plastic
- ○ Flashlight
- ○ Shoebox or similar box (*no top needed*)

Procedure:

1. Carefully cut 2 vertical slits in one end of the box, you may want an adult to help you. The space between the slits should be smaller than the width of the drinking glass.
2. Place the colored plastic over one of the slits, and tape it in place.
3. Turn on your flashlight and darken the room.
4. Shine the flashlight into the box through the slits.
5. Look inside the box. What is the light doing? Where do the light rays appear on the side of the box?
6. Pour water into the glass, and place it in the center of the box. Repeat steps 3 and 4.
7. What happens to the light beams after they pass through the glass of water?

Explanation:

The box is a model of your eye. Light enters through the opening in the front of your eye (the iris) and passes through a crystalline lens. The lens focuses the light into an image that falls on your retina (the inside of the back of your eye). When an image falls on the retina, nerve cells send signals to your brain which are interpreted to create an image.

Information inspiring imagination

KINGSTON
FRONTENAC
PUBLIC LIBRARY

YOUR PUBLIC LIBRARY

Design a 3D object! Consider all the angles as you sketch it below.

Top	Bottom
Left Side	Right Side
Back	Front

kfpl.labs

Bring your design to life! Learn all about 3D design using Lynda.com at **http://www.kfpl.ca/online-learning/lyndacom**. Once you have your digital design ready, visit us at **www.kfpl.ca/library-services/3d-printing** to learn about using our 3D printers.

centre for neuroscience studies
AT QUEEN'S UNIVERSITY

http://neuroscience.queensu.ca

Queen's UNIVERSITY

WELCOME TO THE WORLD OF NEUROSCIENCE!

How fast does information travel in the nervous system?

Information travels at different speeds within different types of neurons. Transmission can be as slow as 0.5 meters/sec or as fast as 120 meters/sec. Traveling at 120 meters/sec is the same as going 432 km/hr!!!

Why are our brains so wrinkly?

During evolution our brains grew faster than our heads. In order to fit them in our heads, they became wrinkled. On average, the more wrinkled the brain, the more intelligent/evolved the animal.

Let's talk concussion!

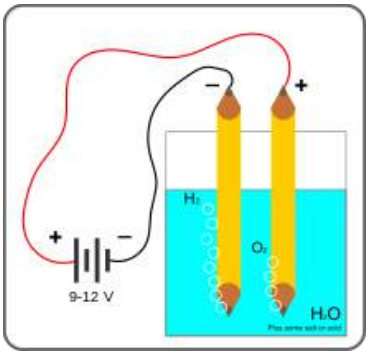
Concussion is the most common type of traumatic brain injury in Canada, accounting for approximately 75% of all head injuries occurring annually. Want to learn more? Come chat with our team about signs and symptoms, actions plans and more regarding sport-related concussions.

CESAP

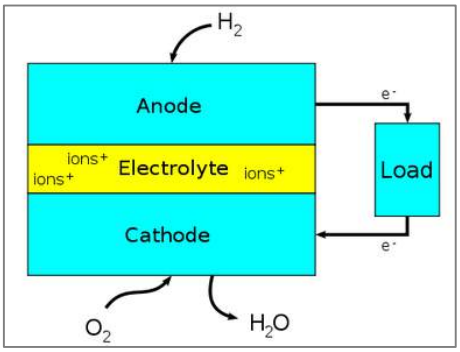
Come check out our booth to learn more about the brain!

Energy

Do you know that every time you use energy it was produced with a chemical or nuclear process? Energy is produced in power plants which utilize water, coal, uranium, wind, and the sun. The sun and the wind are called alternative or regenerative sources and their use is better for the environment. However, sun and wind are not reliable. We can use hydrogen to store energy and make it available when we need it. Hydrogen is a material with the chemical symbol H. It is the lightest and most abundant chemical substance in the universe.



We can use electrical energy to split water into hydrogen and oxygen in a so-called electrolyser. The hydrogen can be stored in vessels.



We can "burn" hydrogen in a fuel cell to produce energy and water. The coupling of electrolyser and fuel cell along with alternative energy sources may be our future energy economy.

Three experiments:

1) Produce electrical energy from two nails and a lemon.

2) Make an electrolyser to produce hydrogen and oxygen from two pencils, a battery, water and baking soda.

3) Make a fuel cell which produces electrical power from hydrogen and chlorine using two pencils, a battery, water and sodium chloride.

The Barz Lab; Contact: barzd@queensu.ca

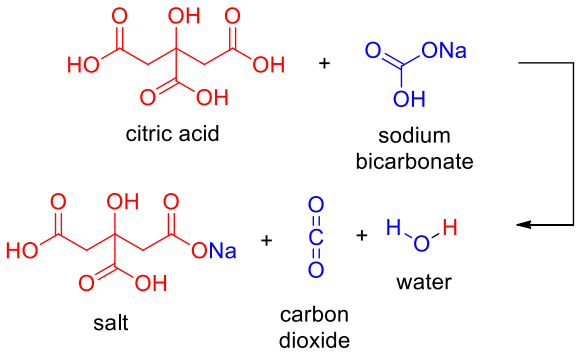
Faculty of Engineering and Applied Science
Chemical Engineering

Queen's University

Volcano in a Bottle

Alka-Seltzer Tablets

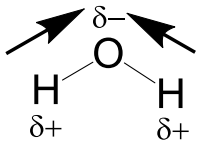
Alka-Seltzer tablets contain three ingredients: citric acid (an acid found in limes and lemons), sodium bicarbonate (a base found in baking soda), and aspirin to help relieve pain. In the solid form, citric acid and sodium bicarbonate cannot react but once dissolved in water these two molecules combine to form a salt, water and carbon dioxide in a neutralization reaction.



"Like Dissolves Like"

In molecules, some atoms attract electrons more strongly to themselves than others. This property is measured by their electronegativity, a number given to all atoms. The higher the number, the stronger the atom pulls electrons away from other atoms.

In molecules such as water, the oxygen atom has a large electronegativity so it pulls away electrons from the hydrogens bonded to it, forming a charged dipole, where oxygen is more negative and the hydrogens are more positive.



Because of this dipole, the positive hydrogens are attracted to the negative oxygen. In organic oils, there are no dipoles. When water and oil are added together, they do not mix because water has a dipole and repels the oil.

Density

Density is a measure of how well-packed a chemical is. Chemicals that are more dense sink to the bottom while the less dense chemical rises to the top. Between water and oil, water is more dense so oil will float on top.

A homemade lava lamp can be made by layering oil on top of water in a bottle. By adding Alka-Seltzer tablets to the bottle, the citric acid and sodium bicarbonate dissolve in the water. They react together to form carbon dioxide, a gas that is less dense than oil or water. These gas bubbles surround themselves with water and flow to the surface where they rupture when exposed to air. The water brought to the surface then cascades back into its bulk phase.

How to make your own lava lamp:

Materials

- A water bottle or 2L pop bottle
- Water
- Vegetable oil
- Food colouring
- Alka Seltzer antacid tablet

Method

1. Fill the bottle up 1/3 of the way with water.
2. Add vegetable oil until the bottle is 4/5 full.
3. Add several drops of food colouring and wait until it has dissolved in the water.
4. Break up the Alka Seltzer tablet into small pieces and add them to the container. Bubbles should start to form and rise up.
5. When the bubbles have ceased, more Alka Seltzer tablet can be added to repeat the process.

*Please conduct under adult supervision.

Queen's University | Department of Physics, Engineering Physics & Astronomy | SNOLAB | CPARC

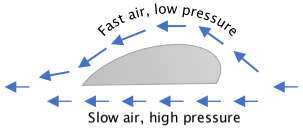
BERNOULLI'S PRINCIPLE

WHAT IS BERNOULLI'S PRINCIPLE?

Bernoulli's principle says that moving air has lower pressure than still air.

WHY DOES IT MATTER?

Although you may not realize it, Bernoulli's principle plays a role in things you see every day! It's what makes airplanes work. Air passes below and above the wing of the plane. The bottom is flat and the top is curved, meaning the air going over has to travel a longer distance than the air going under in the same time, so the air on top travels faster and therefore has lower pressure. This pressure difference between the top and bottom of the wing is what gives the plane lift! The same physics is what allows Frisbees and curveballs to fly the way they do.



EXPERIMENT 1

YOU WILL NEED:

- A thin strip of paper (approx. 1-2"x10")

WHAT TO DO:

1. Place the short end of the piece of paper just under your bottom lip
2. Blow out your mouth and watch the paper flutter upwards!

WHAT'S GOING ON?

Bernoulli's principle says that moving air has lower pressure than non-moving air. So when you blow above the paper, the pressure on top of it goes down while the air below the paper continues to push on it with the same amount of force. This means the pressure on top of the paper is now less than the pressure below, so it rises.

EXPERIMENT 2

YOU WILL NEED:

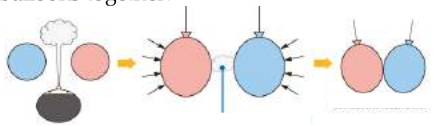
- Two balloons
- Two pieces of string
- Tape

WHAT TO DO:

1. Blow up the balloons, and tie them off.
2. Tie the strings to the ends of the balloons
3. Tape the ends of the strings to the edge of a desk or table, so the balloons hang down freely. You want the balloons to be close but not touching, an couple of centimetres apart
4. Blow into the space between the balloons. What happens?

WHAT'S GOING ON?

Again, Bernoulli's principle says that moving air has a lower pressure than still air. So when you blow between the balloons, the pressure decreases between them and the pressure outside stays constant, pushing the balloons together.



Queen's University | Department of Physics, Engineering Physics & Astronomy | SNOLAB | CPARC

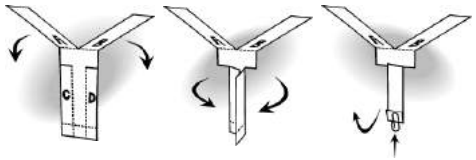
BUILD YOUR OWN HELICOPTER

YOU WILL NEED:

- Colouring tools
- Scissors
- One paper clip

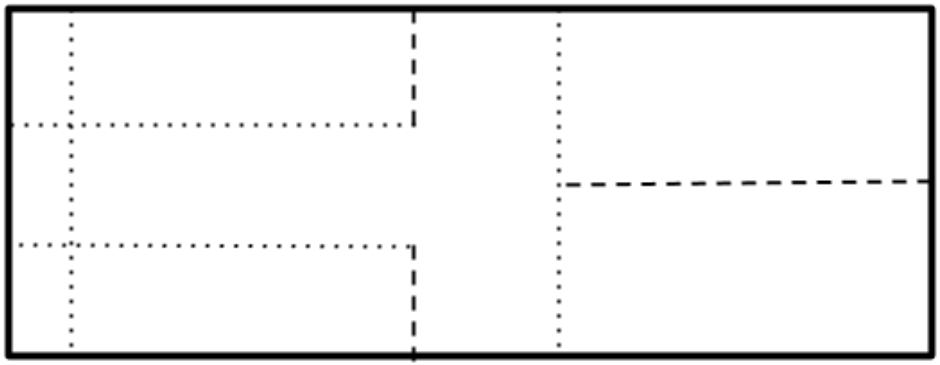
INSTRUCTIONS:

1. Cut out the rectangle below along the heavy solid black line
2. Colour both sides of your helicopter!
3. Cut along the dashed lines
4. Fold the helicopter blades down in opposite directions as shown in the left picture below
5. Fold the sides in as shown in the middle picture below
6. Fold up the bottom and attach a paper clip as shown in the right picture below
7. Test out your helicopter! Hold it by the paper clip and throw it as high as you can, and watch it spin down to the floor



WHAT'S GOING ON?

As the helicopter falls through the air, the air pushes up on the wings. This mostly bends the wing up, but a little bit of the force pushes the helicopter sideways. Each wing gets the same push but in opposite directions, making the helicopter spin!



The Queen's Observatory

Queen's University

The Queen's Observatory has been a part of Queen's University's and Kingston's history for over 150 years! Come out to one of our monthly public Open Houses and see what all of the excitement is about!

Come listen to a professional astronomer share the wonders of the Universe before heading to our outdoor observing deck to view the Moon and planets. Next, head up to the dome to gaze into deep-space with our 14-inch reflecting telescope, sure to dazzle inquiring minds young and old!

Open Houses happen on the second Saturday of every month rain or shine. The event is **free**! Starting times vary throughout the year. Check out our website at observatory.phy.queensu.ca for more information!

The Observatory also runs educational tours for school groups. Visit the website or contact the Observatory Coordinator at observatory@astro.queensu.ca for more information.

Connections
QUEEN'S ENGINEERING EXPERIENCE PROGRAM

Tech 'n' Tinker trailer

IGNITE YOUR IMAGINATION

The Tech n'Tinker Trailer is a mobile makerspace designed to travel to schools in the Kingston area. The makerspace will feature innovative and comprehensive technology for beginner and veteran makers to explore and strengthen their 21st century skills.

Contact us for pricing and booking information: eng.qonnect@queensu.ca or 613-533-6000 x75640

www.engineering.queensu.ca/about-us/educational-outreach/

Queen's University | FACULTY OF ENGINEERING AND APPLIED SCIENCE

W.A.F.F.L.E.S.

4476
Community Robotics

What defines a robot?

- **Sense – a robot has to take in information about its environment. Sensors perform this task**
- **Plan – a robot has to use that information to make a decision. A computer collects and processes data**
- **Act – a robot needs moving parts to carry out commands. A controller receives data from the computer and sends signals to motors**

What ways do robots move?

- **Rotate**
- **Convey**
- **Walk**
- **Swim**
- **Fly**
- **Reach/Bend/Poke**
- **Roll**

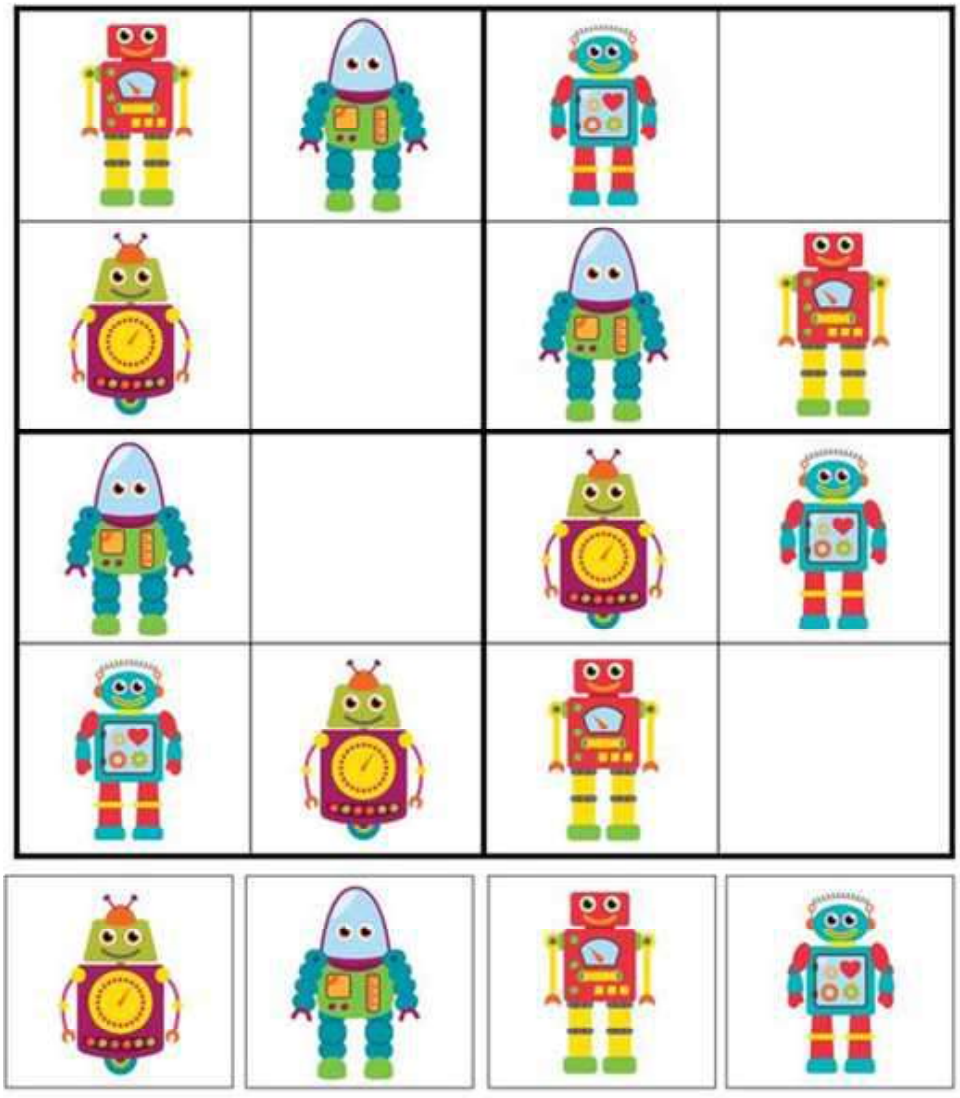
Most robots get around by rolling

- **Walking is hard – it requires balancing**
- **Swimming only works in water**
- **Flying requires a lot of speed and energy**

Wheels and treads make moving over ground easier

They provide stability with multiple points that touch the ground

Sudoku



Students can learn about robots… and much more participating in our community based robotics programs.

Jr. FIRST LEGO League – ages 6-9
FIRST LEGO League – ages 9-14
FIRST Robotics Competition – high school

Visit wafflesrobotics.com for more information on joining a team or starting your own.

KING'S TOWN SCHOOL

What Floats Your Boat?

Density, Buoyancy and an Ancient Scientist in a Tub

When Archimedes stepped into a bath around 200 BC, he made an important discovery. He realized that an object immersed in a fluid displaces a volume of fluid equal to the volume of the object. **Displace** means to move out of the way. Legend has it that when Archimedes made this discovery, he jumped out of the bath and run through the streets shouting "Eureka!" which means "I've found it!".

Archimedes's discovery led to the development of Archimedes Principal:

Archimedes' principle states that the upward buoyant force that is exerted on a body immersed in a fluid is equal to the weight of the fluid that the body displaces.

Floating occurs when an object doesn't fall in air or sink in water, but remains suspended in the fluid. Two forces act on a floating object. The **force of gravity** pulls the object **down** toward the centre of the Earth while the **buoyant force** pushes the object **up.**

What we did at Science Rendezvous:

In our Science Rendezvous activity the aluminum foil boat floats because the weight of the water displaced is equal to the weight of the boat and therefore the forces of buoyancy and gravity are balanced. When pennies are added to the boat, its weight increases as does the downward pull of gravity. When the force of gravity becomes greater than the buoyant force, the boat sinks.

Try this at home:

DENSITY TOWER

Materials

- Honey
- Corn/Karo syrup
- Dish soap
- Water – add green food colouring
- Vegetable oil
- Rubbing alcohol – add blue food colouring
- Lamp oil
- Food colouring
- Turkey baster
- Cups
- Tall vase/glass

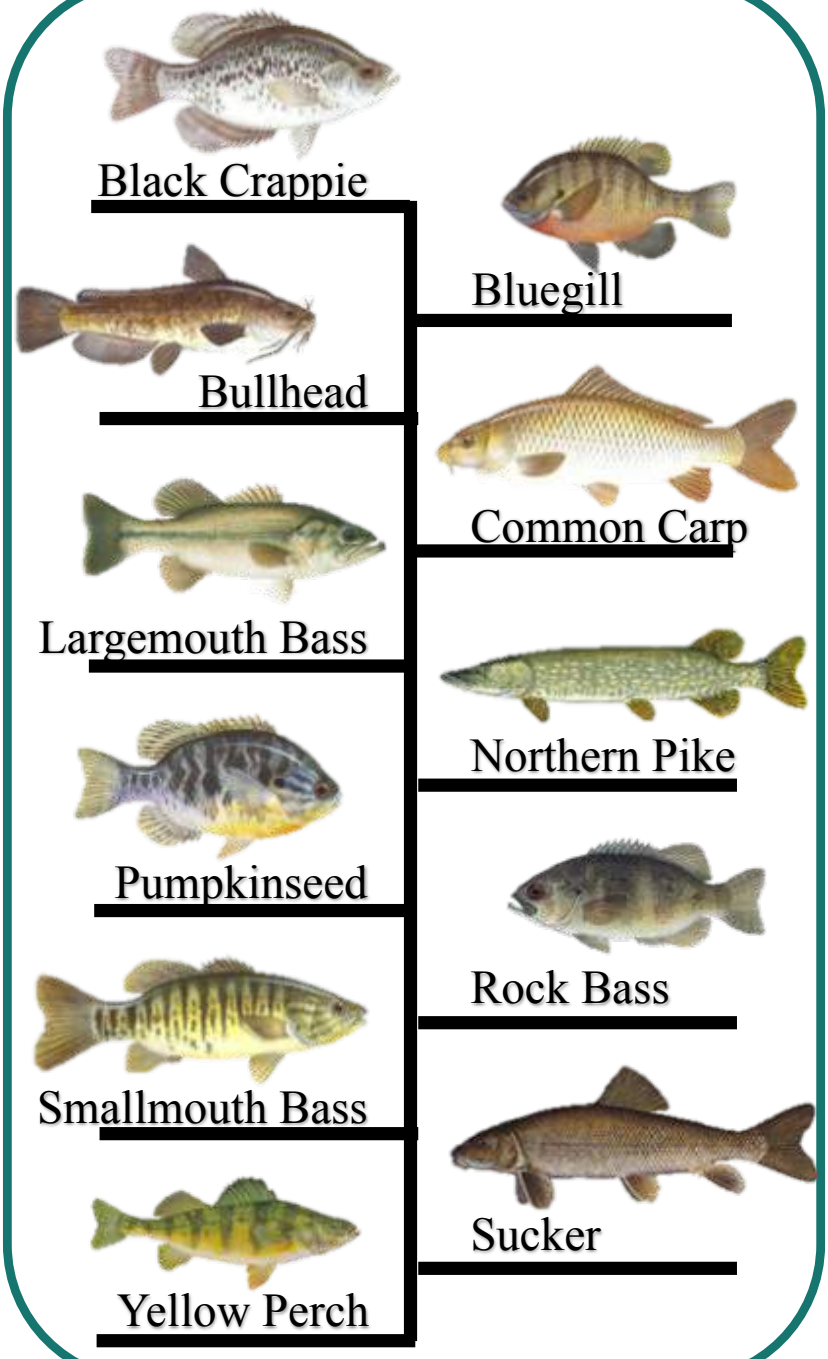
Method

1. Pour **equal** amounts of the seven liquids into small cups – 100 ml of each liquid will be enough. (If you don't have all seven fluids, you may use fewer of them taking care to still add them in the same order.)
2. To put the tower together, the liquids should be added in order from the most dense to the lightest (they are listed in order above).
3. Starting with the honey and corn syrup, pour carefully straight from the cups; don't let the liquids touch the sides.
4. Next is the dish soap. Using the turkey baster, take care to go slowly making sure that the dish soap is added to the centre.
5. For the last layers, starting with the water, use the turkey baster again but add the liquids down the side of the container.

Fish Species of the Kingston Area

QUBS

Queen's University Biological Station
ELBOW LAKE
ENVIRONMENTAL EDUCATION CENTRE



Some of the many fish species that live in our lakes and rivers. Recognize any?!

QUBS public family events!

May 13th-Mother's Day Gardening Workshop

July 8th-Elbow Lake Family Fishing Day

Thursdays Weekly in July & Aug- Elbow Lake Family Night

Visit QUBS.ca and ElbowLakeCentre.ca for more!

Eco-Adventure Day Camp

Learn about fish and *much more* this summer! Weekly day camp in July and August for kids aged 10-14. Leader in Training week for youth aged 15-18. ecoadventurecamp.ca for more info

Rainbow Phytoremediation

Phytotechnologies Lab | Royal Military College of Canada

Did you know that our soils can become polluted? This happens when harmful, unwanted chemicals and materials are dumped into the environment. Some examples are paints, insecticides, fertilizers, or garbage! These are called **contaminants** and if left in the soil, they negatively affect living organisms like plants, animals, and even humans**!** One thing we can do to clean these up is use special plants to remove contaminants from soil (and water too)! This process is known as **phytoremediation**. Environmental scientists use phytoremediation to clean up soil and make it healthy again after it has been polluted. Be just like an environmental scientist and complete this experiment to better understand how phytoremediation works!

What you will need:

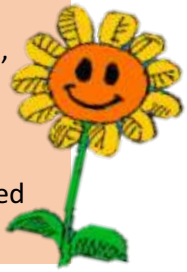
(see image below for setup)

- White flowers
- Small containers
- Water
- Food colouring

Experimental Setup

Instructions

1. Gather all of your materials and label your containers with colours of the rainbow.
2. Add ½ cup of water to each container.
3. Add 10 drops of food colouring to the corresponding containers. Pretend that the food colouring are different contaminants!
4. Cut the stems of your flowers at an angle and place one in each container.
5. Place the containers in a safe location with lots of sun, like a kitchen windowsill!
6. Write down observations and take pictures of your flowers over the next few hours/days.
7. Notice what happens to the flowers. How is this related to phytoremediation?

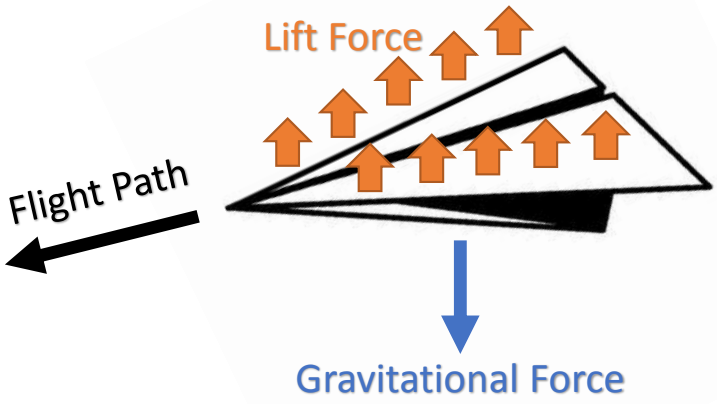


Results and Discussion

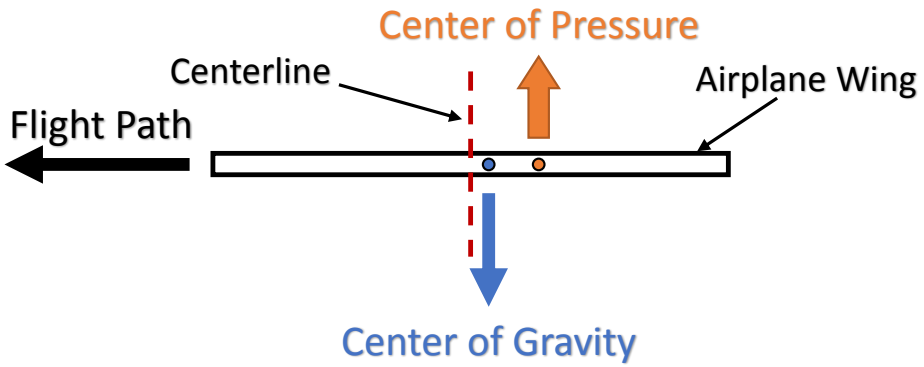
- What happened to the petals of the flowers?
- How long did it take for the experiment to conclude?
- Try this with flowers that are planted in soil and water them using water mixed with food colouring!

Think About It…

Imagine that the food colouring is polluting the water and soil. The white flowers help remove the contaminants. Once the contaminants are secured in the plant, they can be removed and disposed of properly. Not all of the contaminant has been removed from the water, so you can see how the process of phytoremediation can take a really long time. It's hard work to clean up the soil and water to make our environment healthy!



- The Gravitational Force is a force that pulls the airplane towards the earth. The total weight of the plane is represented by a force that pulls at the Center of Gravity.
- The Lift Force is a force that pushes the plane upwards due to air moving over the wings. The total lifting force on the wings is represented by a force that pushes from the Center of Pressure.



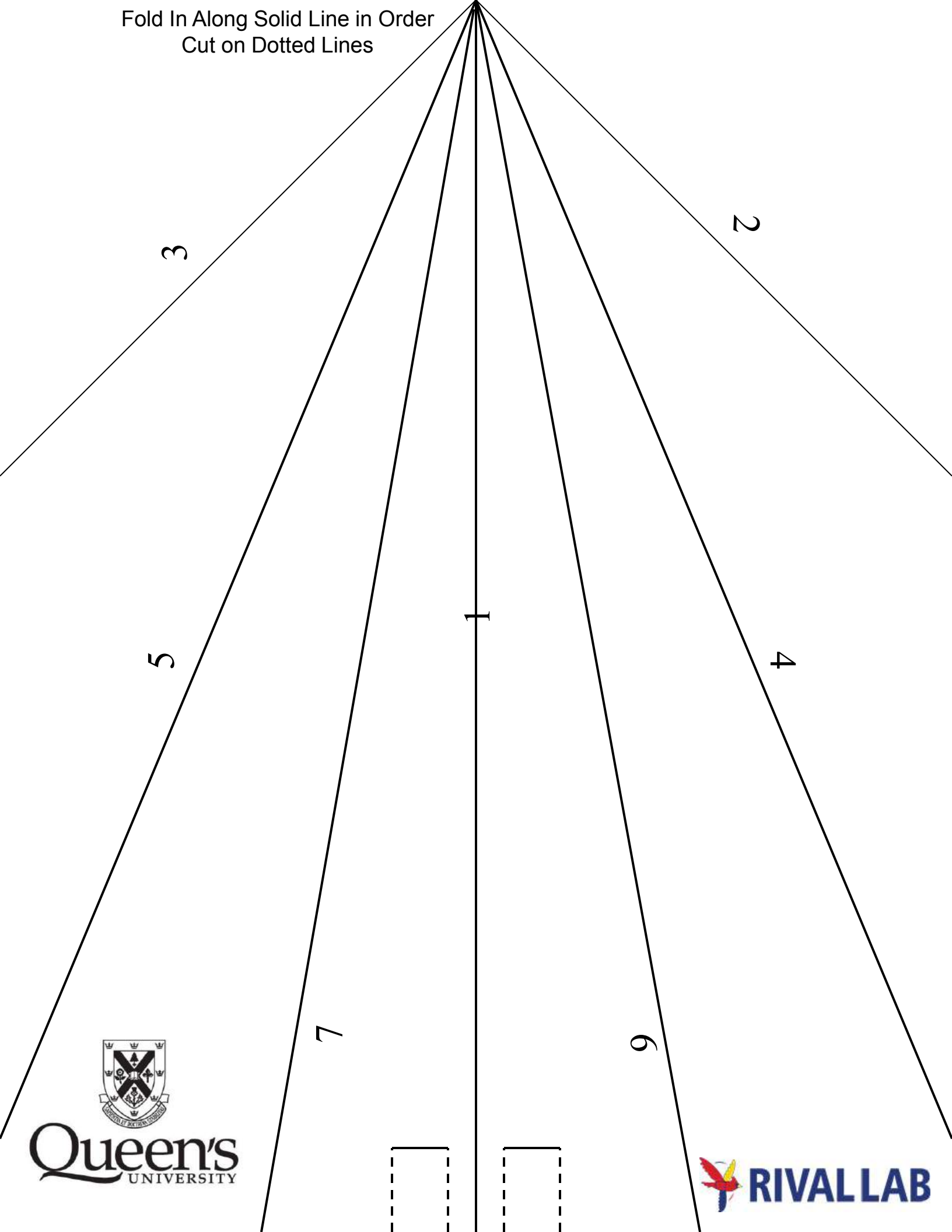
- The Center of Gravity of most paper airplanes is located behind the centerline of the original piece of paper due to how the paper has been folded.
- The Center of Pressure of most paper airplanes is located even farther behind the centerline.
- The Center of Pressure needs to be located **behind** the Center of Gravity in order to maintain stability!

Experiment!

Attach a penny to the rear of a paper airplane using a paperclip and try to make it fly.

- What's happening? The weight of the penny is changing the position of the Center of Gravity of the plane so that it is now behind the Center of Pressure!
- Can you move the penny to re-stabilize the plane?

Fold In Along Solid Line in Order
Cut on Dotted Lines



Queen's UNIVERSITY

RIVAL LAB

Rubber Bones Experiment

Purpose

To demonstrate the importance of calcium for maintaining strong bones.

Additional information

Calcium, as many of your parents or teachers may have told you, is vital for maintaining healthy and strong bones. Weighing in at number 20 on the atomic scale, Calcium (or Ca for those who prefer our element symbols), is the lightest of alkaline metals with a density of only 1.55 g/cm. This soft gray earth metal is the 5th most abundant in the human body, not surprising since it's a vital structural element of healthy bones. Drink your milk and keep those bones strong!

Required materials

- Large empty jar with a lid
- Several chicken bones, preferably a leg bone or drumstick
- Vinegar

Estimated Experiment Time

Only about 10 minutes to set-up and several days (3 to 5)for the bone(s) to become rubbery.

Step-By-Step Procedure

1. Make sure your bones for this experiment are thoroughly cleansed, with any meat removed from the bones. Try washing the bones with warm water mixed with a little salt.
2. Take a bone and try bending it before placing it in the jar. Notice how hard the bone is before it's placed in the jar.
3. Place the bones in the jar.
4. Fill the jar with vinegar, just enough so that it completely submerges the bones.
5. Place the lid on the jar and secure tightly.
6. Leave the bones to soak in the jar for at least 3 to 5 days.
7. After several days have passed, open the jar and drain the vinegar. Remove the bones from the jar and rinse under water for a few seconds.
8. Try bending the bones now and compare it to when you tried bending the bones in the beginning of the experiment.

Note

Both red wine vinegar and white vinegar will work, but you may want to stick with the white to avoid any chance of staining your clothes or anything around you.

Observation

Why do you think the bone is hard before you place it in the jar? What mineral makes the bone that way? What happens if that mineral that makes the bone hard is extracted? What will happen to the bone? What could you use instead of vinegar to get the same effect? What if you used a bone from a different animal? Try it with a left over pork or beef rib.

Result

The vinegar in the jar, which is a mild acid, breaks down the calcium in the chicken bones. When the calcium dissolves, there is nothing left to keep the bone hard. The soft tissue of the bone is all that remains, which is why it takes on a rubbery nature.

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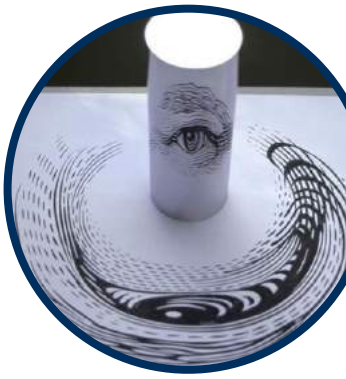
Anamorphic Art

Anamorphic art has a long history, having roots in cultures from around the world, including China, England, France, and the Netherlands. Distorted images were used for everything from amusing royalty to carrying secret messages. During the Victorian era, anamorphic art and viewers were popular and inexpensive toys for children.The idea of anamorphic drawings is to create an image on a curved grid. By doing this, the image appears distorted and it is difficult to tell what the image is. The only way to see the image clearly is to use a cylindrical mirror. You could say that it is mathemagic!

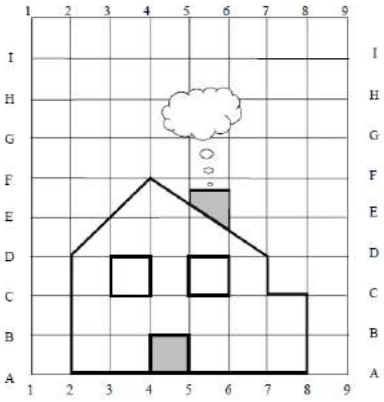


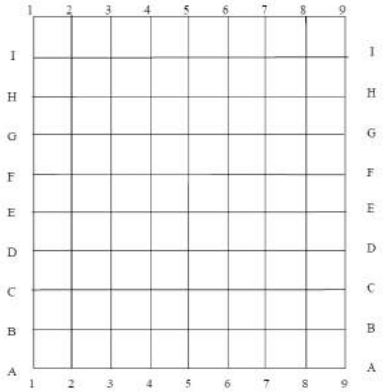
To create your own anamorphic art, you will need:

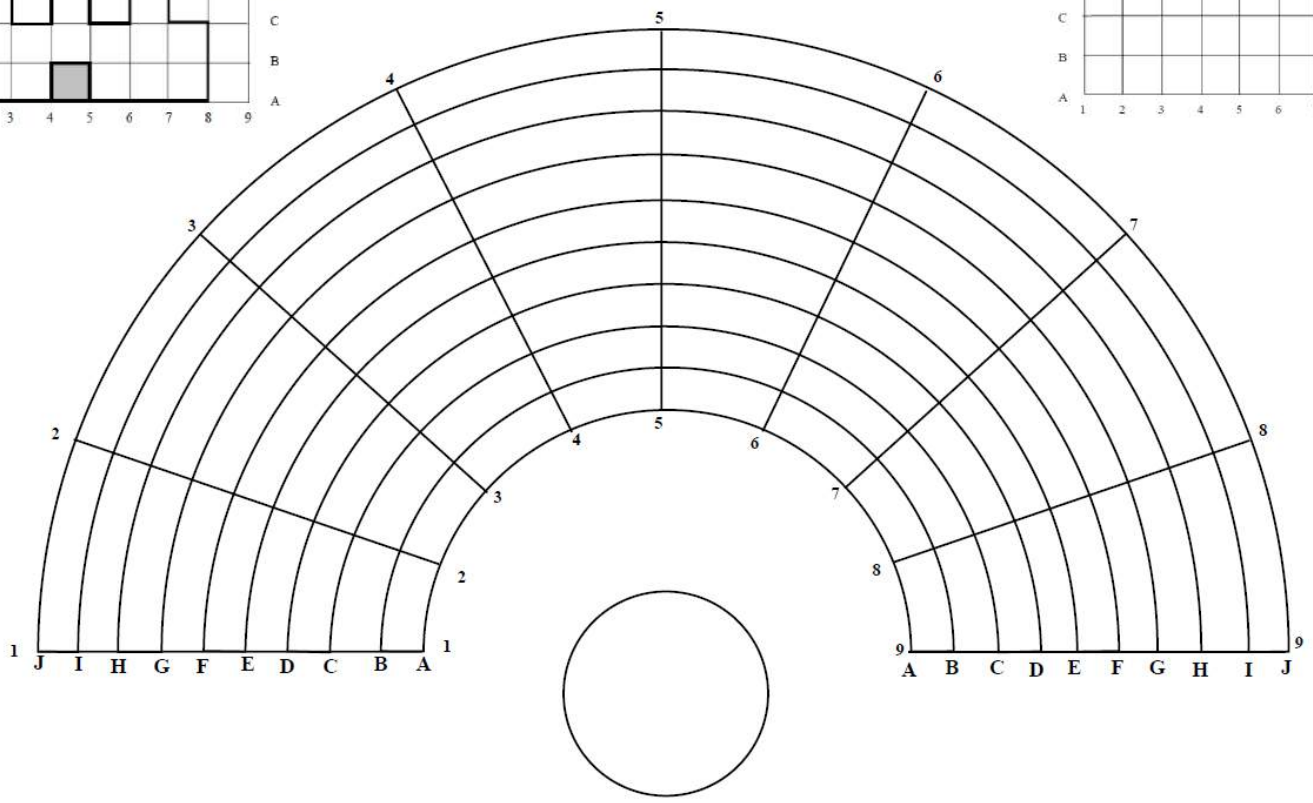
- Mylar sheet with reflective coating, ~15 cm x 15 cm (available from Art Supply Stores – or you can use tin foil)
- Tube, plastic bottle, or other cylinder about 4 cm in diameter. Be sure that the cylinder fits onto the circle on the grid exactly.
- Tape
- Copies of a blank square grid, a blank curved grid, and a simple grid pattern (we use a house)

Then follow these steps:

1. Draw the house pattern from the square grid onto the curved grid by mapping points on the square grid to the equivalent points on the curved grid. Remember to use a pencil.
2. Place the cylindrical mirror onto the circle which is printed at the centre of the curved grid. Look into the mirror. The house should appear be like the drawing on the square grid.
3. Use the blank grid to draw your own original design and then map the points from the square grid onto the curved grid.







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