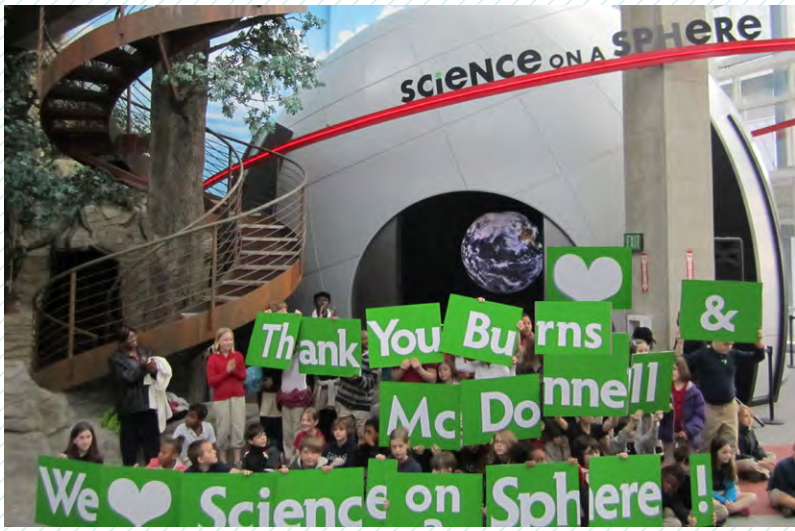
BURNS & McDONNELL

BATTLE OF THE BRAINS

Kansas City's most exciting K-12 STEM competition!

#botbkc


SIMPLE MACHINES AT PLAY


SCIENCE ON A SPHERE
Thank You Burns & McDonnell
We Science on Sphere!


Nov.
Burns & McDonnell
SCIENCE CITY


MORE THAN 97%
OF THE WORLD'S WATER
TOO SALTY TO DRINK

BURNS & McDONNELL

BATTLE OF THE BRAINS

Helping kids CREATE something AMAZING with STEM.

The drive to strengthen communities is the heartbeat of Burns & McDonnell, in our work and with the **Burns & McDonnell Foundation**. Over the past few years, we've invested more than **$6 million** in grant programs that support STEM (science, technology, engineering and math) education.

Why do we care so much about this cause? Every day, our employee-owners rely on STEM skills, passion and a lifelong curiosity to change the world. The opportunity to light the same spark and build the same foundation in kids? Well, that's pretty amazing.

We believe the United States should be a place where kids engineer a revolutionary water filtration system or design a building with zero environmental impact. We believe in empowering the next generation of STEM professionals to do more than just use apps, but to design them. **We believe it's our responsibility to help these kids change the world.**

STEM workers earn 29% higher wages

65% of students will work jobs – NOT YET – IMAGINED

↑ 8.9% increase in STEM jobs from 2014 to 2024

THE JOURNEY

of Burns & McDonnell Battle of the Brains

BURNS McDONNELL FOUNDATION

January 2011

Our leaders create a gigantic idea: a competition to inspire kids to think big about STEM in support of Science City.

September 2011

Battle of the Brains kicks off with more than 560 entries, representing the big ideas of 2,500 students.

GENETICS UNLOCK THE CODE

EVERY LAST DROP

December 2014

Our team works with the winning students to open the latest exhibits — *Genetics: Unlock the Code* and *Every Last Drop*.

September 2015

We shake things up for the third competition cycle with a new challenge — to build Science City's first outdoor exhibit, generating proposals from 5,300 students.

September 2015

Science City earns the prestigious Roy L. Shafer Leading Edge Award for Visitor Experience from the Association of Science-Technology Centers.

November 2015

At another exciting ceremony, schools receive $155,000-plus in grants and Mason Elementary is awarded the top prize.

December 2016

Attendance at Science City has increased 84 percent since the competition began.

November 2011

After months of hard work, the top 20 schools receive $155,000-plus in grants — and Olathe North is awarded the Grand Prize for *Unplugged*.

March 2013

After working with students, our team of architects, engineers and construction managers unveils *The Science of Energy* featuring *Unplugged*, the first million dollar exhibit.

September 2013

The second competition cycle attracts more participation than ever, with 3,500 students from 50 school districts submitting 501 big ideas.

November 2013

The top 20 schools get $155,000-plus in grants and we shock the crowd by announcing the construction of TWO exhibits — the entries from Leawood Elementary and Olathe North.

December 2013

Science City announces a double-digit growth in visitors.

May 2017

We debut the latest million-dollar exhibit — a huge outdoor science playground called *Simple Machines at Play*.

September 2017

So far, more than 11,000 students (and counting) have participated in the competition — and hundreds of thousands more have visited the resulting exhibits.


IMAGINE ENERGY


MORE THAN
OF THE WORLD
TOO SALTY


BURNS McDONNELL
BATTLE OF THE BRAINS


I inspired this!
EVERY LAST
DROP
I inspired this!
GENETICS


JUST PLANE ZIPPY
THE WHEEL

INSPIRED BY KIDS,

built by Burns & McDonnell

A science center thrives because of inviting exhibits, but also because it's valued as a community amenity. A beneficial cycle begins with repeat attendance and volunteer support, providing financial support that pours back into the center. At Science City, the **Burns & McDonnell Foundation** is giving that beneficial process a kick-start with **Battle of the Brains**, a multimillion dollar grant program.

Burns & McDonnell Battle of the Brains is Kansas City's most exciting **K-12 STEM competition**, with a premise that's wholly unique. Metro area schools earn a piece of the $155,000-plus grant for STEM education by dreaming up an exhibit concept for Science City — and one school sees their idea come to life in a $1 million exhibit. The benefit to the community is twofold: **promoting STEM education** and adding new **innovative exhibits** to Science City.

So far, more than **11,000 students in 50 school districts** have benefited from this immersive educational opportunity. The competition has produced four interactive exhibits: Science of Energy, Genetics: Unlock the Code, Every Last Drop and Simple Machines at Play. The **Burns & McDonnell Foundation** has also invested in two additional exhibits — Science on a Sphere and the Burns & McDonnell Engineerium.

These additions have made a difference at Science City, helping to boost attendance by **84 percent** and encouraging thousands of visitors each year to explore STEM topics. Students and teachers are sharing rave reviews about Science City as a place where learning and fun happen in equal measure.

The Exhibits


UNION ST
LEVER LIFT

SIMPLE MACHINES AT PLAY

Humans have always looked for better ways to do things. **SIMPLE MACHINES AT PLAY** explores six special mechanical devices — the simple machines — that have transformed our world by letting us do more work with less effort. While simple machines are used to make work easier, in this expansive outdoor exhibit they're the basis for play too! You'll climb, race, lift and slide — moving your body and engaging your mind on the way to a better understanding of these transformative inventions.

- Levers help us feel stronger by making heavy things easier to lift. How strong are you? With the **Lever Lift**, you're strong enough to lift your friends in a giant globe! A lever is a beam that moves around a fixed point called a fulcrum. It helps move a heavy load on one end when effort is applied to the other. Test your strength by trying to lift the globe using different ropes hanging from the beam.
- In **Just Plane Zippy**, race a friend down one of two exhilarating zip lines, but don't forget to look up. There's a simple machine right above you — the zip line itself is an inclined plane! Usually, objects are moved up or down an inclined plane to a different elevation. Here, you are the object that is moving. How will an extra push, or applied force, affect who zips faster?
- Any ramp or slope is an inclined plane — and the greater the tilt, the faster an object moves. At **Acceleration Plane**, place weighted wheels at the top of each ramp and let go to see how gravity works against friction. Switch things up by adjusting the weights on the wheels to see if you can affect how quickly they zoom down the inclined planes.
- Can you imagine a world without wheels? Go for a spin on The **Wheel Deal** and learn firsthand how a wheel and axle makes work easier. When you apply force, a wheel rotates on an axle, reducing friction to make it easier to move an object. You couldn't move this giant structure without this terrific twosome! Grab onto the outside or sit inside as this machine does its work.
- In **Pulley Power**, you can lift a bowling ball with ease — a feat made possible by a simple machine called a pulley. It's just a rope looped around a wheel on an axle, but it packs a lot of power. By changing the direction of the force applied, you can lift something heavy with ease. Pull a rope to lift the bowling ball, then let it go to send a tennis ball flying into the air!
- A fork, a shovel, teeth — they're all examples of the wedge, a triangle-shaped tool with at least one slanted side. One of the oldest simple machines, wedges help you lift or separate objects with less effort. In **Wedge It**, you can use one kind of wedge (your hands and feet) to scamper up a wedge-shaped climbing wall.
- Slide down the ridges — or threads — of a screw in the **Screw Slider**. You can rotate the threads in a screw to hold objects together, or twist them to lift materials out of the ground. A screw's power depends on how close together the threads are. The closer the threads, the easier it is to turn. How quickly and easily can you turn yourself down the slide?
- Ready for an adventure? Scale the massive, three-story tall **Luckey Climber** to get a bird's-eye view of the simple machines in the exhibit. It's a climber and sculpture in one — there's nothing else like it in Kansas City!

EVERY LAST DROP

Water feels ordinary to us because it's so familiar, but it's a truly extraordinary molecule. **EVERY LAST DROP** explores water and our relationship to it.

In **What Is Water?**, dive into the fascinating scientific properties of H_2O.

- Splash and learn at two activity-packed **Water Tables**. Use tabs to direct the flow of water, turn a water wheel, overflow a tipping cylinder, toss balls into a water vortex and more!
- Make water move uphill with an **Archimedes Screw**. One of the oldest architectural tools, it helps H_2O defy gravity.
- Look up! The lights above the exhibit have a story to tell. They're **Suspended Water Molecules**, and they reflect the physical states of the three phases of water.
- In this exhibit, you'll even learn from what you sit on. The **Water Is Life Benches** share simple but surprising facts about the world of water.
- Ice, liquid or vapor — water is a beautiful, captivating wonder. Investigate the **Phases of Water** through three interactive touchscreens.

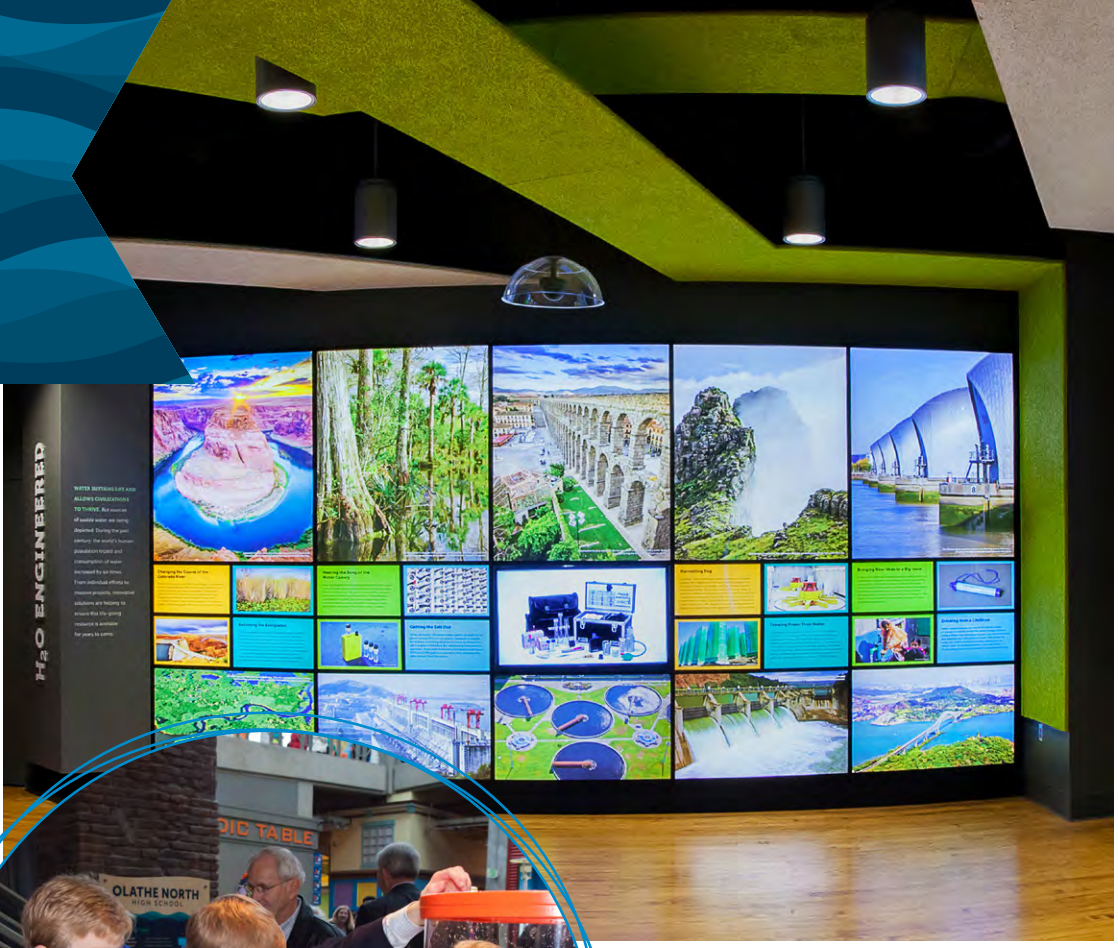
In **Tapped Out**, learn more about how we use water and why we should conserve it.

- Learn more about **Rain Barrels** and how they help conserve water. (Though this is probably the only one filled by a **Floating Faucet**.)
- The **Tapped Out Room** is a visual masterpiece with stunning images and interesting stories.
  - From individual efforts like the Life Straw to massive projects like the Colorado River revitalization, learn more about innovative **H_2O Engineered** solutions.
  - While 70 percent of the Earth's surface is water, less than 1 percent is available for human consumption. Explore **How We Use Water**, from drinking to "hidden water" in food and manufacturing.
  - Most of us have never been really thirsty, but it's different in other parts of **Our Tapped Out World**. Learn more about water scarcity and the organizations working to help.

Explore the interaction between **Water & Life**, from watersheds to water treatment.

- At **Cleaning Our Water**, pump water, press levers and turn basins at the interactive water treatment wall. Follow the process to understand where you get your water — and where it goes after you use it.
- A river runs through the exhibit and some of it comes to life. Step on the **Projected River** to make waves and chase fish.
- Learn more about the world's **River Cities**, get tips on how to **Clean Up Our Rivers** and read how **Kansas City's Great Flood of 1903** affected Union Station.
- Have you ever walked through a cloud? At the **Cloud Fall**, you'll learn that water is in the air all around you — and experience it for yourself.
- In **Exploring an Aquifer**, go deep in the earth where groundwater is found. Illuminate how water levels have changed over the years and see how much an aquifer refills when it rains.
- When **Stormwater** streams into our storm sewers after a heavy rain, where does it end up? Learn more about Kansas City's approach to keeping our waters clean.
- Sculpt your own landscape on the **Interactive Sand Table**, make it rain and watch water flow through mountains and valleys. It's all under your control in this augmented reality exhibit.

BOTB 2 Exhibit


H2O ENGINEERED


SCIENCE OF WATER
EVERY LAST
DROP


OLATHE NORTH
HIGH SCHOOL


LOOK UP!
EVERY LAST DROP
WATER'S VOL
600 T
HANG
QU


JUST LIKE YOU
ONE SMALL CHANGE
DNA
NCE-OFF!


GENETICS
UNLOCK
THE CODE


ONE SMALL CHANGE
START HERE
Can you curl your tongue?
Is your hairline pointed in the center?
Are your earlobes attached?
A PICTURE OF US

GENETICS

UNLOCK THE CODE

You are 99.9 percent identical to the person standing next to you. **GENETICS: UNLOCK THE CODE** helps visitors discover the science and wonder behind that fraction of a percent.

- At the **DNA Dance-Off!**, hop on an interactive floor to make keratin DNA. See the code — and your results — on a massive LED wall. Compete with others or challenge yourself in the world's first genetic dance-off.
- Copy yourself in the **Duplication Station** — a photo booth with a twist. How will you interact with your group of clones?
- What would you look like with black curly hair and dimples? **Try-a-Trait** is an augmented reality experience that lets you explore what you'd look like with different inherited traits.
- Test your knowledge in the **Genetics Quiz**, using body motion to select answers.
- In **Genes and You**, an interactive book tells the amazing story of you. Flip the pages and watch the story unfold on the screen in front of you.
- Stick out your tongue, smile and check your earlobes and hairline at the **Trait Tree**. Follow the directions to discover how many share your traits.
- **DNA's Double Helix** — the most recognizable symbol in genetics— has a starring role, at the entrance and unwinding throughout the exhibit.
- Walk under the giant, lighted **Chromosome 17**. Each chromosome contains thousands of our genes; learn about some of them here.
- Explore the visual world of genetics at the **Spin Browser**. Spin the dial to speed up or slow down videos of DNA, mitosis, twins and more.
- From regenerating worms to birds that can't sing, learn crazy but true facts about animal genetics in **Genetics in the Wild**.
- We share 99.9 percent of our genetic code with other humans. But we also share 85 percent with cows. At **Genes in Common**, guess how much we are like other species.
- A baby gets half its chromosomes from its mother and half from its father. So is it a boy or a girl? Make a prediction and press a pop-o-matic dome to explore a **Matter of Chance**.
- Will you **Find Your Future** in genetics? Investigate jobs by watching videos of young professionals to guess their career.
- Explore a geneticist's **Picture of Us** — the karyotype — and take a closer look at six genetic conditions.
- How can a genetic condition make **One Big Impact** on muscle strength? Lift two backpacks to see the difference. In **Muscle Bound**, twist a cylinder to show the science behind the change.
- Read the stories on the **Just Like You** column to better understand a day in the life of local young people with Down syndrome, sickle cell disease, hemophilia and cystic fibrosis.
- Genetics is a small, small world. Peer into digital **Microscopes** to explore chromosomes, blood cells, muscle fibers and more.
- Your body has more than 37 trillion cells, and each one has everything needed to copy itself. Learn all about **What's Inside Our Cells**.

BOTB 2 Exhibit

THE SCIENCE OF ENERGY

FEATURING UNPLUGGED THE EXPERIENCE

The **SCIENCE OF ENERGY FEATURING UNPLUGGED** explores energy and our relationship with it. Through interactive discovery, you'll earn a better understanding of where energy comes from, with an emphasis on renewable sources. Build on the basics to understand humankind's impact on energy resources and explore a global perspective into the world's relationship with energy, now and in the future.

- Hop on the **Power Wheel** to harness your own human energy and generate electricity. Step onto the giant wheel and get walking to light up an Unplugged sign while a digital display tracks speed, distance, calories burned and watts of energy generated.

- Demonstrate how the body is an energy-generating machine with the **Bicycle Generators**. Jump on a stationary bicycle and pedal away, transferring the energy from food into motion. That motion, in turn, generates electricity that powers up small electronics relevant to your life.

- The **Electric Hand Crank Generator** explores the machines that turn energy into electricity. Turn the crank to power up lights and a fan, getting an inside look at a generator that uses conductive wires spinning through a magnetic field.

- At the **Wind and Solar Impact Table**, learn more about wind and solar power and its role in our energy mix. By turning up the wind to activate turbines, adjusting sunlight levels and changing the angle on solar panels, you can influence the energy generation of a model city.

- The **Turbine Display** tells more about wind as an energy source, from its use by our ancestors to its practical applications today. A digital display offers interesting content while a massive turbine blade display offers a real-world perspective.

- The **Solar Panel Display** highlights the potential of the sun to help meet our energy needs. Get an up-close view of a solar panel, used all over the world to harness the sun's energy on homes, businesses and even street signs.

- At the **Energy Spectrum Wall**, get a straightforward but comprehensive look at where we get our energy, from nonrenewable fossil fuels like coal and gas to renewable sources like wind and hydro.

- The **Imagine Energy Digital Wall** is a giant, interactive touchscreen with a world of information about energy — history, science, global perspective, future, careers and opportunities. Navigate tabs to reveal information, images and video within a dynamic framework.

  - **The Timeline** offers a historical perspective of humankind's relationship with energy, beginning with the control of fire and continuing through today's exploration of renewable energy sources.

  - **The Science** is a foundational presence for the entire exhibition, offering information on core terminology and landmark discoveries.

  - **Global View** uses an interactive map to offer a comprehensive perspective on energy, instantly identifying countries that are power players in energy production and consumption.

  - **The Future** offers a glimpse of technologies that may shape tomorrow's energy world and a fuller understanding of why this research is so vital.

BOTB I Exhibit


ENERGY SPECTRUM
THE SUN
COAL
OIL
NATURAL GAS
NUCLEAR
FOSSIL FUELS
HYDRO
GEOTHERMAL
BIOMASS
SOLAR
WIND
CONSERVATION
FOOD
CRANK UP THE POWER
BICYCLE GENERATORS
PEDAL YOUR WAY to POWER
Turn the crank!
UNPLUGG-D
ASEP POWER


UNPLUGG-D
HELIPORT
SOLAR PANELS


THE SCIENCE OF ENERGY
PRESENTED BY THE
BURNS & McDONNELL FOUNDATION


SCIENCE ON A SPHERE
DESIGN AN EXHIBIT AND
WIN GRANT MONEY FOR YOUR SCHOOL!
www.battleofthebrainskc.com
COMING SOON TO SCIENCE CITY
SCIENCE ON A SPHERE
IT'S A WONDERFUL WORLD!
BROUGHT TO YOU BY Burns & McDonnell FOUNDATION
EXIT

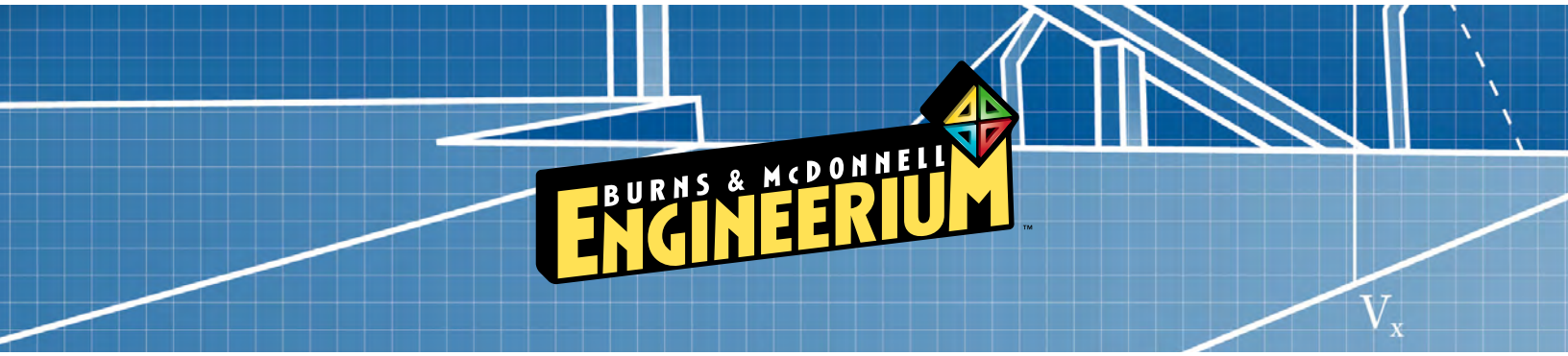

BURNS & McDONNELL
ENGINEERIUM


h
d_x
adidas

SCIENCE ON A SPHERE offers a world's worth of information — literally! This room-sized, global display system uses computers and video projectors to display planetary data on a 6-foot-diameter sphere. Science On a Sphere was developed by the researchers at the National Oceanic and Atmospheric Administration (NOAA) to help illustrate earth system science for people of all ages.

Using NOAA's collective experience and knowledge of the Earth's land, oceans and atmosphere, this exhibit offers captivating lessons on environmental processes. With 360-degree projections, the globe becomes the blue marble of Earth with more than 300 data sets that display weather patterns, tectonic shifts and other geophysical phenomena.

It's a visualization tool that gives you a completely new perspective. With one touch, you can see all the way to the bottom of the ocean where the Titanic sits, the 2011 earthquake in Japan and spreading tsunami, or actual satellite images of our planet taken as recently as two hours before.



The **BURNS & McDONNELL ENGINEERIUM** provides a deep dive into hands-on learning, encouraging kids to consider careers in technology and engineering. Since 2008, the Engineerium has reached thousands of kids who have participated in programs devoted to robotics, computing and sustainability. Relevant, interactive programming appeals to a wide age range with topics such as Robotics 101, LEGO Robot Challenge, Smart Robots and Renewable Wind.

The Engineerium also offers hands-on STEM learning activities that provide scientific and educational content related to touring exhibits at Union Station.

It's a venue that provides ample space for Science City's commitment to daily science demonstrations and weekend workshops. Free 20-minute Saturday Walk-Up workshops include Food Science in the Kitchen, Making Magic in the Maker Studio and Builder Wars with LEGOs. Saturday Science Labs offer the chance to assist in the dissection of a pig heart or cow eyeball.

Other Funded Exhibits


MAKE A DNA BASE PAIR OF KERATIN
TO BEGIN, STEP ON THE YELLOW SQUARE
DNA DANCE-OFF!
WHAT TO DO


DID YOU KNOW?
SKY BIKE

SCIENCE CITY'S NEXT GREAT EXHIBIT

Inspired by kids; designed by Burns & McDonnell

LEARN MORE AT
botbkc.com

BURNS McDONNELL

BATTLE OF THE BRAINS

Brought to you by

BURNS McDONNELL FOUNDATION

SCIENCE CITY AT UNION STATION