Republic of the Philippines
Department of Education
REGION VII - CENTRAL VISAYAS
DIVISION OF CITY SCHOOLS - TAGBILARAN CITY

Office of the Schools Division Superintendent

September 2, 2024

DIVISION MEMORANDUM
No. 600 , s. 2024

FIRST INTERACTIVE SCIENCE MOBILE MUSEUM

To: All Public Elementary and Secondary School Heads
All Private Elementary and Secondary School Heads
All Others Concerned

1. This has reference to the Regional Memorandum No. 719, S. 2024 dated August 13, 2024, titled **First Interactive Science Mobile Museum.**

2. This Office, through the Curriculum Implementation Division (CID) would like to invite all public and private elementary and secondary learners and teachers to visit the **First Interactive Science Mobile Museum** to different venues in **Region VII from September 2024 – March 2025.**

3. The involvement of students and teachers/educators from both public and private schools is contingent upon the decision of the Schools Division Superintendent and is subject to compliance with no-disruption-of-classes policy outlined in DepEd Order No. 9, s. 2005, titled "Instituting Measures to Increase Engaged Time-On-Task". Additionally, participation in the activity must adhere to the no-collection policy as articulated in Section 3 of RA No. 5546, "An Act Prohibiting the Sale of Tickets and/or the Collection of Contributions for Whatever Projects or Purpose from Students and Teachers of Public and Private Schools.

4. Immediate and wide dissemination of this memorandum is desired.

WILFREDA D. BONGALOS PhD CESO V
Office of the Schools Division Superintendent

WDB/JAAL/CID/JTB/cmfc

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DEPED TAGBILARAN CITY DIVISION
SDS RECEIVED
BY _____ DATE 8/14/2024

Republic of the Philippines
Department of Education
REGION VII - CENTRAL VISAYAS

Office of the Regional Director

REGIONAL MEMORANDUM
No. 719 , s. 2024 13 AUG 2024

FIRST INTERACTIVE SCIENCE MOBILE MUSEUM

To: Schools Division Superintendents
All Others Concerned

1. Attached is the invitation from Mr. Sylfred Sege Gonzales, Marketing Executive for Education of Avia Prime Eduvent Management, inviting learners and teachers to visit the First Interactive Science Mobile Museum to different venues in Region VII from September 2024 – March 2025.

2. The involvement of learners and teachers from both public and private schools is dependent upon the decision of the Schools Division Superintendent and is subject to compliance with the no-disruption-of-classes policy outlined in DepEd Order No. 9, s. 2005, titled "Instituting Measures to Increase Engaged Time-On-Task." Additionally, participation in the activity must adhere to the no-collection policy as articulated in Section 3 of RA No. 5546, "An Act Prohibiting the Sale of Tickets and/or the Collection of Contributions for Whatever Projects or Purpose from Students and Teachers of Public and Private Schools."

3. For information and dissemination.

SALUSTIANO T. JIMENEZ EdD, JD, CESO III
Director IV
Regional Director

STJ/FYA/CLMD/MJCD/bca

Avia Prime Eduvent Management

"Your Edutainment Partner"

RS 2024-19361

August 1, 2024

AUG 07 2024

8 3:30

Dir. SALUSTIANO T. JIMENEZ, JD, EdD, CESO III
REGIONAL DIRECTOR
DEPED REGION VII

Dear Dir. JIMENEZ;

Greetings of peace!- **HAPPY SCIENCE!**

Avia Prime Eduvent Management by Xplorasi, is a group of Professional Educational Events Coordinator, Organizer and Exhibitor whose aim is to provide a more effective and enjoyable way of transmitting knowledge to its clientele. The group is well exposed to the various facet of education that will surely and productively guarantee total quality LEARNING.

For this season **AVIA PRIME** will be bringing in your Region, **the FIRST INTERACTIVE SCIENCE MOBILE MUSEUM** with a Theme **"OUR CURIOUS MIND: SCIENCE & ARTS INTERACTIVE MOBILE MUSEUM"**, a Travelling exhibit designed to reach out to students in every corner of the archipelago, delivering exciting science & arts exhibits to students and teachers alike.

Avia Prime, "OUR CURIOUS MIND" have reached thousands elementary, high school and college students and toured to various regions throughout the country, including impoverished areas. With the mission of bringing the fun science to the classroom, the exhibits will be able to create a learning environment where science concepts are discovered in an entertaining way and imagination can capture the hearts of young minds and promotion of **K-12 STEM Strand (Science, Technology, Engineering and Mathematics)** that can develop the students' ability to evaluate simple to complex societal problems and be responsive and active in formulation of its solution.

"CURIOUS MIND, Interactive Science Mobile Museum" will Travel to Different Venues in REGION VI- starting on the Science Month of September 2024-March 2025

In line with this, we implore your kind indulgence and request for an endorsement/advisory from your good office, for your students and teachers to visit our Science Mobile Museum where they can **discover and re-discover The World of Science & Arts**.

Rest assured, that we will abide by the DEPED GUIDELINES FOR THE OFF-CAMPUS ACTIVITY and following the policies and guidelines stipulated in Deped Order No.9s.2005 entitled "Instituting Measures to increased Engaged Time-on-Task and Ensuring Compliance therewith. And the programs will be purely voluntary.

Suite 203 GJ Building Quezon Avenue, Quezon City
Office Tel No.(02) 7000 5156 ; (0999) 3966214 ; (0906) 3505088 ; (0927) 5803673
Email Add: aviaprime88@gmail.com

Avia Prime Eduvent Management
"Your Edutainment Partner"

"I Have no Special Talents. I am only passionately **CURIOUS**"
-Albert Einstein

Make a Difference... Visit

"CURIOUS MINDS, INTERACTIVE SCIENCE MOBILE MUSEUM

"GET INVOLVED IN CREATING OUR FUTURE SCIENTISTS".

We look forward to hearing from you with regard to this proposal. Should you wish to discuss details further, feel free to contact us: **(02) 8697 6361 ; (02) 7000 5156 ; 09993966214 ; 09063505088; 09275803673**

Thank you and God Bless!

Your education partner,

SYLFRED SERGE GONZALES, RN
Marketing Executive for Education
09993966214 / 09275803673

Avia Prime Eduvent Management

"Your Edutainment Partner"

OUR CURIOUS MINDS:

Interactive Science & Art Mobile Museum

The SCIE-xhibit Stations

The Curious Men & Women | The Future Scientist | Tree of Knowledge | Light of the Dark | Virtual Reality | Science of Life | Science Games | PhotoCLICKtensis | Experiment Room | Magic or Science | Evolution of Technology| The Techno-bot

The SCIE-xhibits

Plasma Sphere

Body Conductor

Human Battery

Magical Levitation

Magnetic Sculpture

Bernoullis Blower

Tornado

Vortex Racer

Face Kaleidoscope

Fiber Optics

Fresnel Lens

Infinity Mirror

Optical Mirage

Polarizing Filter

Solar Cell

Cycloid Racer

Pythagorean Theorem

Whirlpool Section

Pin Screen

Stereo Vision

Strobe Light Carousel

Time Freeze

Cloud Ring

Head on a Plate

Bazzooka

Circuit Racer

Energy Needs Work

The Illusionist

Body Paint

Light Mix

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OUR CURIOUS MINDS:

Interactive Science & Art Mobile Museum
















Experience Explore Excel

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Avia Prime Eduvent Management

"Your Edutainment Partner"

Creates Experiences and Opportunities for students to enjoy Science with more than 30 Educational Science Exhibits to Discover.
We created highly visual, colorful and well-crafted exhibits that employ graphics, computer software and the latest technology to present scientific phenomena in the best way possible.
Partnering with Science Communities and worked with Different Science Organizations

Avia Prime is a company composed of Professional Educational Events Coordinator/Organizer/Exhibitor whose aim is to provide a more effective and enjoyable way of transmitting knowledge to its clientele. The group is well exposed to the various facet of education that will surely and productively guarantee total quality learning.

Avia Prime envision itself as a group of professionals devoted and willing to take risk on the relevant innovations for the common good in the field of educational evolution, experience and expertise as means for socio-economic recovery.

Avia Prime missions is to inculcate contextualize Educational Entertainment Tourism in the system of global competence applicable in all walks of life and to enhance a simplified learning process in response to the signs of the time.

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Curious Minds-Interactive ScienceMobile Museum
Avia Prime Eduvent Management

Avia Prime Eduvent Management
"Your Edutainment Partner"

CURRICULUM GUIDE

Primary
(Kinder to Grade 3)

Social and Emotional Development

Curious Minds offers interactive experiment sessions for the students to discover and re discover themselves while interacting with others. They will learn to recognize and respect individual differences through the collaboration of each team during the activities.

Curious Minds Scianators facilitate carefully designed activities, they aid kids in expressing themselves, relating with their peers and appreciating other differences.

Physical Health & Motor Development

Curious Minds develop the child's physical and motor skills both fine and gross by allowing them to explore purposeful movements. We let them freely play in our different kiddie science gadget.

Cognitive Development

Curious Minds 2 hour exploration and enjoyment, students are given a walk-through of the featured science gadgets. They will able to gain knowledge on the different science inventions' informative talks and wall infographics.

Multilingual Development

As they Interact with others the students will develop their communication skills; they will expand their vocabulary by discovering new words for familiar objects. They will learn new terms and even practice basic reading and writing.

Creative Development

Curious Minds Science Entertainment is part of the program inside our science museum offers a diverse mix of opportunities where kids can express themselves in various aesthetic ways. Whether through visual art, music or movement, curious minds is a place where interests are explored, talents are honed and abilities are unleashed.

Mathematics

Curious Minds Exhibits students can able to describe and compare 2- and 3- dimensional objects, manipulate and classify them based on their properties and measure them in creative ways.

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Health

Curious Minds Scienators teach students to sanitize or wash their hands and learn the importance of keeping the body clean, understanding the responsibility of one's health and safety. They develop character qualities like grit and leadership as they cheer each other on and persevere throughout a challenging task.

Science

Curious Minds Science Museum concepts such as matter and force are explored everywhere as students take on activities that make them aware of the movement and positions of persons and objects. They are further immersed in other concepts like basic ecology, human life, animalandia and the magic of science thru optical illusions etc. students are able to tap into their curiosity and scientific literacy in a hands-on and engaging manner.

Intermediate
(Grade 4 to Grade 6)

Language

Curious Minds Science Museum, students can actively participate and employ appropriate verbal and non verbal communication, take careful note of instructions and information given to them and relate their experiences in different gadgets to their personal experiences. Student also communicate important information about a certain gadgets, share their opinions about it, and give quick demos.

Curious Minds Scianators always begins with a discussion. Throughout this discussion, students are encouraged to ask and respond to questions and share their thoughts or experiences.

Art

During their exploration inside the science museum students will learn new shades of color such as pastel and neon. Students will enjoy experiments on colors and its combination.

Health

In Curious Minds one of the exhibits is all about human life-safety is a priority. The students will learn basic first aid for common injuries and when needed and respond to simulated emergencies. Students become a leader and be responsible.

Math

In unique ways, learning Mathis brought out of the classroom and into practical situations. In one of the exhibit-The Human Life, students practice how to measure body temperature using thermometers and realize how medical tools such as these provide important information to those who use them. The students will not only engages their numeracy, but also their persistence and critical thinking skills.

Science

Student often wonder how things are made, there are several places to spark and fuel that curiosity. There are several ways in which students encounter scientific concepts and principles, one such way is when they are consistently expected to follow health and safety rules like proper handling of exhibits. Throughout the endeavor, they must use their adaptability and critical thinking skills to succeed.

Junior and Senior High School
(Grade 7 to Grade 12)

Social and Emotional Development

Curious Minds offers interactive science mobile museum for the students to discover themselves while interacting with different gadgets and with others. They will learn to recognize and respect individual differences through the collaboration of each team during the activities.

Social Science

Curious Minds offers interactive experiment sessions for the students to express themselves while learning with others. They will learn to recognize and respect individual differences through the collaboration of each team during the activities. Student learn the interdependent roles of individual, taking active part in this community allows them to make comparisons with their own communities and pushes them to realize the value of each exhibits.

English

Throughout their stay in curious Minds Science Mobile Museum, student engage in various ways of sharing, locating, experimenting and understanding information, following oral and written directions in order to follow processes, expressing their ideas, opinions and experiences and asking and responding to questions, whether individually or with others, one's literacy skills and creativity are cultivated here.

Mathematics

Curious Minds Mobile Museum teaches how physics is important in our daily life some of the gadgets are Bernoulli blower, canon ball, Pythagorean theorem, cubes and others that can apply and use in daily living of everyone. Students can manipulate and classify them based on their properties and measure them in creative ways.

Science

Curious Minds Interactive Science Mobile Museum with the Help of our Scienators or Science facilitators students encounter scientific concepts and principles, another is when topics often discussed in the classroom come alive through hands-on activities. Students must use their adaptability and critical thinking skills to succeed.

Science Mobile Museum is designed to tickle the minds and curiosity of students. Displays and exhibits will leave them asking and solving how gravity affects motion, or how positive and negative molecules repel or attract each other. They will further learn the laws of motion.

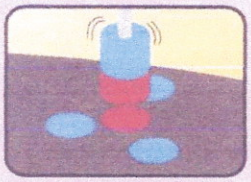
Exhibits on Electricity and Magnetism

thelearningspace

EXHIBITS ABOUT
Electricity & Magnetism

Magnetic Pendulum

Slowly rotate the black table and observe the movement of the pendulum.



What happens to the pendulum when it is over each group of magnets?

What's happening?

The magnet in the pendulum has its south and north poles marked by red and blue paint. The magnets on the table are colored according to the same convention. There are three sets of magnets, each set has a different combination of exposed poles. When the sets are moved under the pendulum, the pendulum starts to swing without you having to touch it. Since like poles repel and opposite poles attract, the pendulum behaves differently when each group of magnets are turned underneath it.

Applications

Electric motors, audio speakers

Generator

EXHIBITS ABOUT
Electricity & Magnetism

Body Conductor

Blow air into your forefingers to moisten them. Using one finger from each hand, touch the two metal strips at the same time.

Join hands with 1 or more persons and let each free hand touch one metal strip.

What's happening?

The human body can be a conductor of electricity as it is largely composed of water. When you touch both metal strips, you are in fact completing the electric circuit. A very small electric current flows through your body that is too weak for you to feel. When you join hands with another person and have each one touch the metal strips, the electric current is still able to pass through your bodies to complete the circuit.

Applications

Switches, Appliance Safety (Grounding)

Magnetic Pendulum

EXHIBITS ABOUT
Electricity & Magnetism

Magnetic Fields

Move the bar magnet along the surface of the disk containing iron filings.

What happens to the iron filings when they are under the magnet?

What's happening?

In this exhibit, the iron filings will help you see the invisible magnetic lines of force of a magnet. The tiny particles of iron align themselves along these lines tracing the shape of the magnetic field. The magnetic field comes out at one end of the magnet and loops around to the other end. When you use two magnets and try to bring two like poles together, you will see from the shape formed by the iron filings how the magnetic fields try to repel one another.

Applications

Geology, Navigation

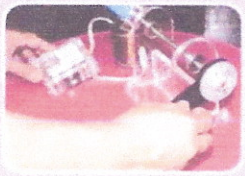
Body Conductor

EXHIBITS ABOUT
Electricity & Magnetism

Generator

Turn the crank slowly. Observe the gauge.

Turn the crank the other way.



What happens to the gauge needle when you turn the crank?

What's happening?

When one end of the horseshoe magnet turns towards the coil, its magnetic field induces electric current to flow through the wires, similar to a paddle wheel causing the water in a channel to flow. This setup is a very simple demonstration of how to turn mechanical energy (by rotating the magnet) into electrical energy and is the essence of all electric generators and motors.

Notice that when the other end of the magnet takes its turn to move along the coil, the needle in the gauge swings the other way and vice versa. This is because the two ends of the magnet have opposite magnetic field directions, causing the induced electric current in the wire to go back and forth. This current is called an alternating current.

Applications

Electric motors, power generators

Magnetic Fields

EXHIBITS ABOUT
Electricity & Magnetism

Magnetic Levitation

Put the plastic card on top of the ball. Put the ball on the underside of the frame. Release the ball.

What happens when you carefully remove the card?

APPLICATIONS

Maglev Trains, Electric Motors.

What's happening?

One principle of magnetism is that opposite poles attract and similar poles repel each other. On the right side part of the exhibit, the magnets are arranged on top of each other. The magnets are arranged in such a way that like poles face each other. Since like poles repel, the magnets push against each other, keeping themselves apart. This force is strong enough to make the top magnet float.

The exhibit on the left is another form of magnetic levitation. This time, two magnets are pulling the globe in opposite directions – towards the top and towards the bottom. The weight of the globe also exerts a downward force on itself. With the help of the plastic card, you position the globe at just the right distance from these two magnets where all the forces acting on the globe are balanced out. When you carefully take the plastic card off, the result is a globe that is suspended in mid-air!

Magnetic Levitation

EXHIBITS ABOUT
Electricity & Magnetism

Hand Battery

Blow air into your palms to moisten them. Put your left hand on the copper plate and your right hand on the aluminum plate.

What makes the gauge move?

Applications

Batteries, switches, electrical safety

What's happening?

When your hand touches the copper and aluminum plates, your body acts like the acid in a car battery. When your damp and salty left palm touches the copper plate, a chemical reaction happens. This reaction takes electric charge away from the copper plate. On your right hand, a different chemical reaction takes place as you touch the aluminum plate. This reaction adds charge to the aluminum plate. The charges pass through your body from one hand to the other. The human body is a conductor of electricity especially if your skin is moist. You don't feel the electricity that flows through your body because it is very small.

The excess charges that accumulate on the aluminum plate flows through the meter and then to the copper plate to equalize the charges that were missing there, thereby completing the electric circuit.

Hand Battery

EXHIBITS ABOUT
Electricity & Magnetism

Energy Needs Work

Turn the crank and press one of the buttons.

What happens when you select a bigger light bulb?

Applications

Power generation and consumption.

What's happening?

Inside the generator is a coil of copper wire around a magnet. As you turn the crank, electricity is being induced to flow through the wires to power the light bulbs. Turning the crank faster induces more current to flow, thus making the light bulb glow brighter.

When you select a bigger bulb to turn on, it becomes harder to crank up the generator. The bigger bulb has a higher resistance to electric current. If you try to press all the buttons at the same time, the crank becomes even harder to turn because the total resistance of the bulbs add up to oppose the flow of electricity. In order to keep all the bulbs glowing, you need to produce more electricity by exerting more effort in turning the crank.

Energy Needs Work

EXHIBITS ABOUT
Electricity & Magnetism

Magnetic Lines of Force

Hold the bar magnet slightly above the table. Observe the compasses underneath.

What happens when you move the magnet across the compasses?

Applications

Navigation, Geology

What's happening?

A compass consists of a magnetized needle that is free to rotate and align itself with the Earth's magnetic field. The compasses all point towards north: the needles almost parallel to one another. When you bring the bar magnet closer, its magnetic force becomes a much stronger influence on the compasses than the Earth's magnetic field. The needles will then align themselves to the nearest magnetic lines of force from the bar magnet. Even if the magnetic fields are invisible, you can figure out their shape by observing the pattern of the compass needles.

When you quickly rotate the bar magnet, the needles begin to spin wildly as pointers are either being attracted or repelled by the north and south poles of the magnet.

Magnetic Lines of Force

EXHIBITS ABOUT
Electricity & Magnetism

Plasma Sphere

Gently touch the glass globe with one finger.

What do you feel after touching the glass for a long time?

Applications

Astronomy, neon signs, modern TVs

What's happening?

The glass globe contains plasma – a hot, ionized gas. Plasma is also defined as being the 4th state of matter, as it does not consist of molecules like the other 3 states instead, a plasma is made up of ions.

A plasma is simply a gas-like cloud containing charged particles such as electrons and ions. The electrons are broken free from a parent atom or molecule, and then atom or molecule becomes an ion. The electron has a negative charge, and the ion has a positive charge. When these charged particles move about within the plasma, they are changing the local characteristics of the electromagnetic field. This combined with the resulting electromagnetic field from the electrons will "excite" ions, molecules, and atoms. When these particles collide excited, they very quickly radiate this energy in the form of a photon, or unit of light. This is what makes the plasma emit its characteristic color, and the color will depend upon the gas that originated it and it's temperature. The characteristics of how these electromagnetic fields combine is what determines the overall appearance of the plasma globe. The gases used in plasma spheres are usually argon, neon and krypton.

Plasmas are the most common phase of matter. Some estimates suggest that up to 99% of the entire visible universe is plasma!

Energy Needs Work

Plasma Sphere

EXHIBITS ABOUT
Electricity & Magnetism

Magnetic Levitation

Hold the ball (with the red part above) over the three red lights on the black platform. When they light up, release the ball.

What do you think makes the ball float on air?

What's happening?

One principle of magnetism is that opposite poles attract and similar poles repel each other. On the left side part of the exhibit, two disk magnets are arranged on top of each other. The magnets are arranged in such a way that the like poles face each other. Since like poles repel, the magnets push against each other, keeping themselves apart. This force is strong enough to make the top magnet float.

The exhibit on the right is another form of magnetic levitation. This time, two magnets are pulling the globe at opposite directions – towards the top and towards the bottom. The weight of the globe also exerts a downward force on itself. With the help of the red lights, you can position the globe at just the right distance from these two magnets where all the forces acting on the globe are balanced out. When you release the ball, the result is a globe that is suspended in mid-air.

APPLICATIONS

Maglev Trains, Electric Motors.

Electron Bender

EXHIBITS ABOUT
Electricity & Magnetism

Magnetic Sculpture

Make sculptures using the metal nuts over the magnets. Pile them one on top of the other.

What figures can you make?

What's happening?

Magnets can be of two types: permanent or temporary. A temporary magnet is one that will lose its magnetism. For example, soft iron can be made into a temporary magnet, but it will lose its magnetic power in a short while. Temporary magnets can also be made by subjecting metallic objects to a magnetic field. While under the influence of the magnetic field, the object will behave like a magnet, attracting other metal objects. The metal nuts in this exhibit become temporary magnets when they are over the three magnets. Once they become magnetized, you can stick additional nuts to them and so on, making a magnetic sculpture.

Applications

Astronomy, neon signs, modern TVs

Magnetic Levitation

I'm a Scientist!

Exhibits on Forces

thelearningspace

Magnetic Sculpture

EXHIBITS ABOUT
Electricity & Magnetism

Electron Bender

Hold the magnet over the television screen. Move the magnet around.

What makes the colors that you see under the magnet?

What's happening?

A stream of electrons can be bent by a magnetic field.

The colors that we see in a television monitor are actually electrons striking red, green and blue phosphors in the face of the TV. Magnets are used to direct the electron beam into the proper position. When a strong magnet is brought close into the face of the TV, you are basically introducing a very strong magnetic field into the stream of electrons. This magnetic field bends the electron beams to make them travel in a different direction as originally intended, thus messing up the colors of the picture. So, it's not so much that the magnet creates colors but that it distorts the colors of the intended picture on the TV.

APPLICATIONS

Televisions, electron microscopes

EXHIBITS ABOUT
Forces

Gyroscope

Hold the wheel up with one hand and spin it as fast as you can. Let go.

What happens to the wheel as it turns around the axle?

What's happening?

When you spin the wheel fast enough, the forces that tends to make it fall down are continuously rotated, cancelling themselves out. No matter what angle you hold the wheel up, it will try to maintain that angle without falling down. This is the main principle of gyroscopes.

But what makes the wheel revolve around the steel pole? The wheel revolves because of gravity. The gravitational force continuously acts upon the wheel as it spins on its axis. When this gravitational force, as it is rotated, acts on the sides of the wheel, there is no other force to balance it. This makes the wheel revolve around the pole.

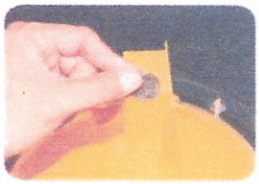
APPLICATIONS

Airplanes, Rockets, Bicycles

Forces

Vortex

Drop a coin at the top of the track. Try coins of different sizes.



Can you create the same effect without using the track?

APPLICATIONS

Washing machines, Race tracks

What's happening?

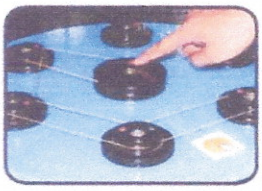
Dropping a coin on the track gives it an initial velocity and guides it to travel around the top of the funnel. It develops a centrifugal force that keeps it from falling over. To keep the coin from slowing down, the parabolic shape of the funnel gives the coin a shorter and shorter distance around the funnel. The coin rolls faster, maintaining the centrifugal force needed to keep the coin rolling on its side. When the coin reaches the bottom of the funnel, the shape is no longer parabolic, so the coin immediately drops down.

Vortex

Forces

Pulleys

Connect the wheels using the rubber bands and turn the big wheel.



Maintain the speed you turn the big wheel. How fast can you make the other wheels turn by using a combination of rubber bands?

APPLICATIONS

Electric pumps, car engines, Lifts

What's happening?

A pulley is a wheel with a groove along its edge for holding cords. In this exhibit, the pulleys are connected by using a rubber band to form a continuous loop. This system of pulleys and belts is used to transmit power from one rotating wheel to another. You can also cross the belt so that the direction of the other wheel is reversed.

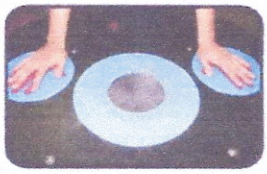
Notice that the main pulley has a bigger diameter than the other wheels. This means that for one complete turn of the big wheel, the smallest wheel would have to turn almost one and a half times to keep up because of its smaller circumference. Because of this, pulleys and belts are also used when you want to increase or decrease the rotation required for a certain mechanical operation. When you combine pulleys, they either serve to amplify your input speed, or slow it down, depending on how the pulleys are connected.

Pulleys

Forces

Cloud Rings

Press the button for a few seconds. When you see thick clouds inside the center hole, push down the table top.



What can you observe in the cloud of mist?

APPLICATIONS

Tornadoes, typhoons, whirlpools

What's happening?

When you push the tabletop down, it forces out the cloud of mist through the hole at the top. The cloud ring is generated by friction between the hole's edge and the mist flowing through the hole. Since the cloud is partially blocked by the plate around the edges, the mist is forced back down and collides with the mist coming up from the center, causing it to spin. The resulting cloud forms a swirling pattern called a vortex. Notice that the cloud spins from its center and curls on its edges, forming the shape of a mushroom. The spinning motion allows the cloud ring to keep its shape for some time. The shape of the cloud varies according to how strong and even you push on the table.

Cloud Rings

Forces

Coupled Pendulum

Swing just one of the pendulums. (You might need to hold the other pendulum still, then let go of both at the same time.)

After some time, what happens to the other pendulum? What happens to the first pendulum when the second starts swinging?

APPLICATIONS

Mechanical clocks, building design, bridge engineering

What's happening?

The two pendulums are connected by a spring. When you swing the first pendulum, it lightly pulls on the other pendulum through the spring, which then gives the second pendulum a small tug. Since both pendulums have the same length, the pulls of the first pendulum happen exactly on the natural frequency of the second pendulum so that it starts swinging too. Soon, the second pendulum will almost be in full swing.

Once the second pendulum starts swinging, it also pulls on the first pendulum. This time it pulls at the "wrong time". Together with friction, this causes the first pendulum to slow down. Energy from the first pendulum is being transferred to the second pendulum until eventually, the first pendulum is brought to rest. When this happens, its now the first pendulum's turn to take energy back from the second pendulum.

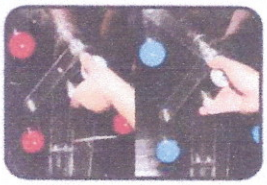
This continues the back and forth swinging between the two pendulums.

Coupled Pendulum

EXHIBITS ABOUT
Forces

Chaotic Pendulum

Try to make the two pendulums start at exactly the same position as possible. Release both handles at the same time.



After some time, do the pendulums move the same way?

What's happening?

This exhibit shows what happens to a large pendulum when smaller pendulums are attached to it. Each of these pendulums influence the motions of others in the system, and this produces a complicated and unpredictable overall movement.

It would be very difficult to make the pendulum swing exactly the same. Just a tiny difference in the way you move and release the handle can make drastic changes in its later movements. This high sensitivity to starting conditions to influence future behavior is a characteristics of chaotic systems.

APPLICATIONS

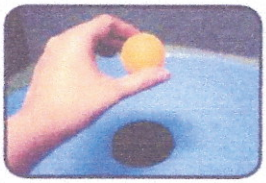
Weather, fires, stampede

Chaotic Pendulum

EXHIBITS ABOUT
Forces

Bernoulli Blower

Catch the floating ball in your hand. Put it back and try make it float in the air.



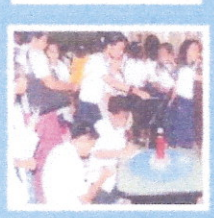
Why does the ball stay afloat? Why doesn't the ball get blown out of the air stream?

What's happening?

As the ball floats above the fast moving air, the air that is moving fast along the sides of the ball exerts less sideways pressure on the ball than the still air in the room. If the ball tries to escape, the higher pressure outside the airstream pushes it back. This is why the ball stays in the center of the airstream. Gravity and the force of the airstream balance each other out to make it float in midair.

APPLICATIONS

Airplane flight, car design, perfume atomizers



Bernoulli Blower

EXHIBITS ABOUT
Forces

Air Bazooka

Aim the air bazooka at a target. Pull hard on the handle inside the air bazooka. Release.

What do you feel when you put your hand in front of the air bazooka?

What's happening?

When you shoot the air bazooka, you are actually pushing billions of air molecules!

The air around us, although oftentimes invisible, is composed of molecules. Unlike solids and liquids, air molecules are spaced very far apart. Using machines like the air bazooka, you can compress air rapidly to make it transfer force or energy.

When you pull on the triggering mechanism of the air bazooka, you are storing potential energy. When you let go, this potential energy is released as kinetic energy to the air molecules directly in front of the bazooka. These air molecules, in turn disturb the molecules directly in front of them, and so on until the energy is eventually dissipated and absorbed. You can feel this energy when you put your hand or face in front of the air bazooka when it is being operated.

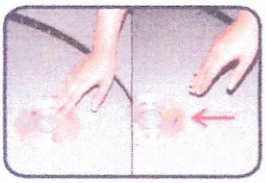
APPLICATIONS

Pneumatics

EXHIBITS ABOUT
Forces

Newton's Laws

Slide one of the disks with your hand along the surface of the table and release.



What makes the disk slide across the table for a long time?

What's happening?

Isaac Newton's First Law of Motion:
An object will stay at rest or move at a constant velocity (constant speed in a straight line) unless acted upon by an unbalanced force.

Isaac Newton's Third Law of Motion:
To every action there is an equal but opposite reaction.

The table is a low friction table using air pumped from underneath. The disks are actually sliding not against the surface of the table, but on a thin cushion of air. This makes the table a good place to experiment Newton's first and third laws of motion. Rubber bands are stretched across the sides of the table to make the disks spring back and forth across the table.

APPLICATIONS

Study of forces, havercraft, printing, manufacturing

Newton's Laws

EXHIBITS ABOUT
Forces

Vortex Racer

How fast can you make the water get from the top bottle to the lower bottle?

Race with a friend and see who figures out the fastest way to do it.

What's happening?

Air bikes drops just like water. For water and air to change places, they need ample room to do it. But because of the small hole between the two bottles, it can take forever for the water on top to get to the bottom bottle, even with the assistance of gravity. Sometimes the water will also stopping altogether!

The fastest way to do it is to make the water swirl around the bottle. If you spin the bottles around a few times, the water in the upper bottle starts rotating. As the water drains into the lower bottle, a vortex forms. The water is pulled down and forced toward the drain hole in the center by gravity. If we ignore the small friction forces, the angular momentum of the water stays the same as it moves inward. This means that the speed of the water around the center increases as it approaches the center of the bottle.

To make water move in a circle, forces, called **centripetal** forces must act on the water. These "center pulling" forces are provided by a combination of air pressure, water pressure, and gravity. The hole in the vortex allows air from the lower bottle to flow easily into the upper bottle. This enables the lower bottle to drain smoothly and completely.

APPLICATIONS

Bottle-filling plants, liquid products factories

Vortex Racer

Exhibits about
Forces

Tornado

Push the switch to turn the fans on. What happens to the smoke in the center of the chamber?

Try covering the top hole of the chamber, what happens?

What's happening?

The tornado you see in this exhibit is an illustration of the invisible air draining out in a circular movement (a vortex) at the top of the chamber, like an upside down water drain.

The placement of the fan nozzles in a circular pattern at the bottom of the exhibit causes the air to move in a circular motion towards the escape hole at the top. The smoke merely shows the invisible movement of the air as it exits the tornado chamber.

Scientists study tornadoes to learn more about how weather develops, how particle systems behave, and how fluids and gases behave as they move and interact with surrounding factors.

APPLICATIONS

Bottle-filling plants, liquid products factories

Tornado

I'm a Scientist!

Exhibits on Light

Exhibits about
Light

Polarized Light Mosaic

Place one of the disks with regular transparent tape strips on its surface into the holder between the polarizing filters.

Look through the lens while slowly rotating the front polarizing filter.

What makes the colors you see in the disk with the tape?

APPLICATIONS

Photography, eye protection, manufacturing

What's happening?

The colors that you see result from differences in the speed of polarized light as it travels through the transparent tape.

When polarized light enters the tape, its direction of polarization will be resolved into two perpendicular components. One of these components will be parallel to the length of the tape, and one will be perpendicular. As they travel at different speeds through the tape, they become out of step. When these out-of-step light waves emerge from the tape on the other side, they recombine, making light with a different polarization than the original light's.

The white light shining from the back is made up of light of all different colors, or wavelengths. Since the index of refraction of the tape is different for each color of light, each color has its own unique pair of speeds as it passes through the tape. The result is that the polarization of each color is changed by a different amount for a given thickness of tape.

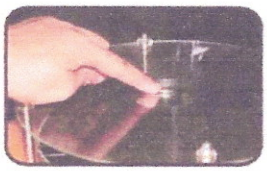
When a second piece of polarizer is placed over the tape and rotated, it transmits different colors at different angles. This accounts for the color combinations, but you see all at given angle, and for this changes in color as the polarizer is rotated.

Polarized Light Mosaic

Exhibits about
Light

Optical Mirage

Look at the object on top of the hole. Try touching it. What happens?



Are you able to find where the real object is?

APPLICATIONS

Satellite dishes, antennae, reflectors

What's happening?

This exhibit demonstrates that light can be redirected and refocused to form virtual images that are not really there. The exhibit consists of two parabolic dish mirrors facing each other. This exhibit works because of the shape of the mirrors - a **paraboloid of revolution**. The shape concentrates light radiation or sound coming from its front towards its focus. In this exhibit the image of the object gets reflected twice. First, the object is reflected all around by the top mirror. Second, the image is then reflected off the bottom mirror and gets concentrated on its focus just above the hole on top. The parabolic mirrors reflect the image from all around so that the image formed at the top is realistic enough to be mistaken as a real object.

Optical Mirage

Exhibits about
Light

Infinity Mirror

Peep through the hole in the front mirror.

What do you observe? Try twisting the front mirror from side to side.

APPLICATIONS

Lasers, visual effects, architecture

What's happening?

What happens when you place two mirrors in front of each other? You get an image of infinity! The image reflected by the first mirror is reflected off the second mirror towards the first and so on to infinity. What you see is an endless recession of reflections towards the center. According to the laws of light reflection, the angle of reflection is equal to the angle of incidence. When you twist the first mirror slightly, the reflection appears to bend because the angle of reflection increases with each repeated reflection.

Twist the mirror in different directions to see more interesting patterns of reflections. Observe also how successive reflections make the lights dimmer as they are progressively absorbed by the mirror.

Infinity Mirror

Light

Light Mix

Move your hand across the table to create different colored shadows.

Can you identify the colors of the shadows produced by the colored lights?

What color is produced by the mixture of all three lights?

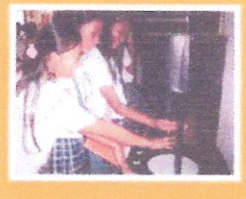
What's happening?

The combination of red, green and blue lights produce white light at the center of the table. When you block one of the lights with your hand, the shadow cast is the complement of that color. If you block the green light, the remaining blue and red lights produce magenta. Red and green form blue's complement yellow. If you block the red light, the result is a cyan colored shadow.

Notice that combining colored lights produces different results than that of combining colored pigments like paint or water color.

APPLICATIONS

Color TVs, computer monitors



Light Mix

Light

Kaleidoscope

Set the two mirrors at different angles. Observe the reflections.

What happens to the reflections when the angle between the mirrors is increased?

What's happening?

This exhibit is a simple **kaleidoscope**. A kaleidoscope makes symmetrical patterns out of a single image by reflecting the image between two mirrors. The smaller the angle between them, the more reflections are produced. Light from the object bounces off the two mirrors, producing the image that you see.

Light rays bounce off each mirror at the same angle they hit the mirrors. The angle which light hit a mirror is called the angle of incidence, and the angle it bounces off is the angle of reflection. When the mirrors are close together, the angles of incidence and reflections are steep and close together, making the light bounce off more times between the two mirrors so that you see multiple images.

APPLICATIONS

Car reflectors, road signs

Kaleidoscope

Light

Invisible Strings

Push the yellow button. Run your hand across the "invisible strings" of the harp.

Can you play music with these invisible strings?

What's happening?

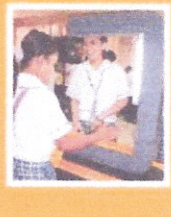
Each invisible string is actually a laser beam directed towards a hole at the bottom of the harp. Inside each hole is a light sensor connected to an electronic switch. This sensor will trigger the switch if it stops detecting light. When you "pluck" the invisible string, you are actually blocking the light that reaches the sensor. The sensor activates the switch for a particular tone generated by an electronic piano.

A laser beam is used as the light source because it generates a focused beam that could reach the bottom of the hole. The light is focused and thin, so it is easy to block and trigger the sensor.

APPLICATIONS

Burglar alarms, industrial machinery

Invisible Strings



Light

Solar Cell

Push the yellow button for about 30 seconds.

Can you see the small light in the house model turn on when you release the switch?

What's happening?

Solar cells that collect sunlight are also called **photovoltaic cells**. Photovoltaics, as the word implies (photo = light, voltaic = electricity), convert sunlight directly into electricity.

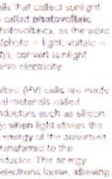
Photovoltaic (PV) cells are made of special materials called semiconductors, such as silicon. Basically, when light strikes the cell, the energy of the absorbed light is transferred to the semiconductor. The energy knocks electrons loose, allowing them to flow freely. This flow of electrons is a current, and by placing metal contacts on the top and bottom of the solar cell, we can use or store that current for future use.

The circuit uses a rechargeable battery to store the electrical energy collected by the solar panel. When you turn off the light source, the inverter automatically takes up the stored electricity to light up the model house.

Longer exposure to the "sun" (main light source) means a longer time for the small light in the model house to stay on.

APPLICATIONS

Power generation, calculators



Solar Cell

Light

Fiber Optics

Choose a figure from the disk under the light by rotating it .

What can you see at the other side of the optic fibers?

What's happening?

Fiber-optic lines are strands of optically pure glass as thin as a human hair that carry digital information over long distances.

The light in a fiber optic cable travels through its core by constantly bouncing along its length – a principle called total internal reflection. Fiber optic cables are designed so that the sides of the cable do not absorb any light from the glass core. Because of this, the light wave can travel great distances.

Some important uses for fiber optics are for medicine (endoscopy) and for telecommunications (telephones and the world wide web).

APPLICATIONS

Medicine, telecommunications, internet

Fiber Optics

EXHIBITS ABOUT
Light

Face Kaleidoscope

Look through one end of the kaleidoscope while a friend looks from the other end.

A kaleidoscope creates an endless variety of intricate patterns by reflecting a single image.

APPLICATIONS

Car reflectors, road signs

What's happening?

This exhibit is actually a large **kaleidoscope**. This particular kaleidoscope is made up of three mirrors facing inwards. The kaleidoscope makes symmetrical patterns out of a single image by reflecting the image on and on among the three mirrors.

Try moving your head from side to side or use your hands and fingers to make more intricate images and patterns.

EXHIBITS ABOUT
Perception

Animation Station

Move the objects a little bit each time you take a picture with the red button.

APPLICATIONS

Movies, Television, Cartoons, Anime

What's going on?

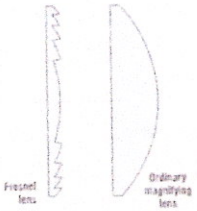
The human brain retains a visual impression for a fraction of a second. This ability is called persistence of vision. In the exhibit, you took 30 pictures of the objects, each time moving them a little bit. When the pictures were shown at a rate of 10 pictures a second, your brain remembers the last frame long enough to give you an illusion of motion.

When watching movies, you are actually looking at a series of still pictures. You are seeing 24 pictures being flashed per second. Because of persistence of vision, you don't notice that the picture screen is also dark half the time. You remember the first picture you see long enough until the next picture is shown, and this gives you the illusion of a continuous motion.

EXHIBITS ABOUT
Light

Fresnel Lens

A lens can be as thin as a sheet of paper



CROSS SECTIONS

Place your hand on the other side of the lens and move it forward and backward. What do you notice?

APPLICATIONS

Lighthouses, overhead projectors, theaters, vehicle headlamps, traffic lights

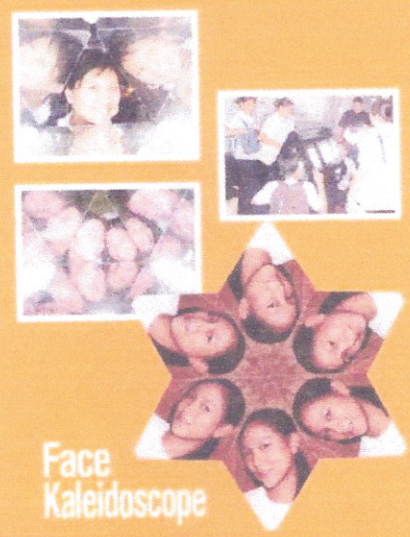
What's happening?

If you have ever looked at the lens of a magnifying glass, you know that it is thick in the middle and thinner at the edges. It would not be very easy to make a big magnifying glass this way because it would be thick, heavy and hard to mount.

The thin piece of plastic in this exhibit is called a Fresnel lens. It is flat on one side and ridged on the other. The basic idea behind a Fresnel lens is simple. It is basically a plastic or sometimes glass lens, ground into a hundred concentric rings (like the rings of a tree). Each ring is slightly thinner than the next and focuses the light toward the center. Each ring is flat on one side and the same thickness as the others. To focus the light toward the center, the angle at each ring's face is different. With a design like this, you can make the same optical lens that your thick Lense Fresnel lenses are often used as solar concentrators.

The Inventor

The Fresnel lens is named for its inventor, French physicist Augustin Jean Fresnel. Fresnel studied light and optics in the 19th century.



Face Kaleidoscope

Animation Station

Fresnel Lens

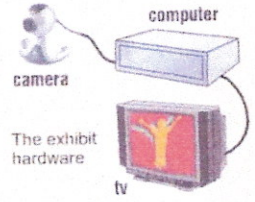
Exhibits on Perception

thelearningspace

EXHIBITS ABOUT
Perception

Body Paint

What happens when our movements can be captured and given colors as we move through time and space?



APPLICATIONS

Movies, Displays, Animation

What's happening?

This exhibit is composed of several components: a camera to record your movements, a computer to process it, and a TV monitor to display it. A plain colored backdrop to make your body stand out is also required. As you move your body, snapshots are being taken a few times each second. For each snapshot, a different color is applied to your image, and the background is dropped. Each subsequent image then is painted over the preceding image and displayed in the TV monitor. This creates the perception of your movements making colorful patterns as you move through time and space.

Body Paint

EXHIBITS ABOUT
Perception

Pin Screen

Turn down the screen to reset the pins. Turn it up and press your face or hand gently on the pins.

Make impressions using other objects.

APPLICATIONS

Manufacturing Industry, Computer Graphics

What's going on?

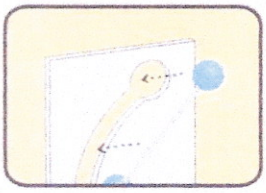
When you press your face on the screen, each pin is pushed as far as the contours of your face makes it. Each pin corresponds to a very small area of your face, when all the pins are viewed together they are able to make a three dimensional image of your face. The play of shadows also helps to enhance the 3D effect. You can easily recognize the image created because the human brain is very good at pattern recognition, in this case, a human face.

Pin Screen

EXHIBITS ABOUT
Perception

Straight Rod, Curved Hole

Can a straight rod pass through a curved hole?



Slowly turn the base and try to pass the rod through the curved slot.

APPLICATIONS

Industrial design, Astronomy

What's going on?

Sometimes our minds can deceive us by jumping into conclusions. Yes, the straight rod can pass through the curved hole.

In this exhibit, the steel rod traces out the surface of two cones as it rotates on its vertical axis. The acrylic plate acts as a plane intersecting these cones through this vertical axis. Because the rod passes through the plate at an angle, the path that the edges of the rod makes through this plane is not straight but rather curved. This curve is called a hyperbola and is the exactly the same shape as the slots. This is why the straight rod is able to pass cleanly through even though the slot is curved.

Straight Rod, Curved Hole

EXHIBITS ABOUT
Perception

Parallel or Tapering Lines?

- The perception produced by this illusion occurs because of the way that neurons that detect dark and bright contrasts in the brain interact.
- Because of the way your brain processes visual information, the stepped patterns of the blocks seem to make horizontal lines taper to the right and left.
- This illusion only works when the blocks are shifted less than one-half the width of the blocks. The illusion completely disappears when the pattern is made into a checkerboard pattern.

Circles or Spirals

Concentric circles with specific patterns can be perceived as spirals by our brains. Because of the patterns, and also because of the way our eyes move around the circle, the brain is tricked into thinking that it is seeing a spiral pattern, instead of unconnected concentric circles

Parallel or Tapering Lines?

Circles or Spirals

EXHIBITS ABOUT
Perception

Language Brain

- It's hard for you not to read a word you're looking at
- Your brain is so accustomed to using language that it tries to override other signals, such as color, even when you consciously try not to
- As a result, you read what the word says before you work out what color it is

Shadow Compensation

Use the mask to verify that five colors are the same

- When you look at an object, you just don't measure the light coming from it
- You also take into account other factors, such as shadows, patterns and surrounding colors, and try to compensate for them
- The center square in the front side of the cube looks lighter because of the darker surrounding colors

Language Brain

Shadow Compensation

EXHIBITS ABOUT
Perception

Expectations

- There are two THEs in sentence "B".
- Your past experience, your expectations and your beliefs affect the way you process information
- You expect to see just the one THE and this overrides the fact that they are actually two

Relative Size

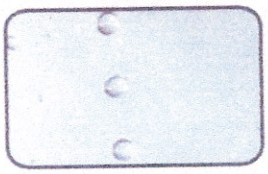
Use the circle mask to verify that the sizes are the same

- If a center circle is surrounded by small circles it looks large by comparison. Conversely, if a center circle is surrounded by larger circles it looks smaller in comparison.
- To make it easier to tell objects apart, your brain seems to enhance differences in the size of objects even more
- As a result, it is difficult to make out the size of the center circles correctly.

EXHIBITS ABOUT
Perception

Time Freeze

Sometimes we need to freeze an event that is happening too fast to understand it.



- **Turn the strobe light on with the left switch.**
- **Use the knob to control the speed of the light flashes.**

What's going on?

A quick flash of light can help us investigate scientific phenomena

This exhibit uses the phenomenon called ***persistence of vision***, the ability of the human brain to retain a visual impression for a fraction of a second.

Scientists use many tools to help them understand how things work. One of these tools is photography. Using the strobe light, the exhibit simulates a succession of very fast photographs of the water gushing out of the shower faucet. Were you surprised at what you found out about the water drops? The strobe light helps us understand quick-moving phenomena by seemingly freezing time on its tracks.

APPLICATIONS

Scientific visualization, photography

EXHIBITS ABOUT
Perception

Head on a Plate

Our eyes can be easy to fool.

Have a friend go to the back of the exhibit to put his or head through the hole in the table. Looking from the front of the exhibit, what do you see?

What's going on?

Many magicians use mirrors to make spectacular illusions. For this head-on-a-plate illusion, try to inspect the table to see how the illusion works.

The table actually has mirrors placed strategically between the table legs. The mirrors reflect the floor tiles and the wall patterns beside it, making the illusion of a complete floor and wall behind and below the table. Of course, this hides the body of the person inside the table, making the magical illusion that his head does not have a body under the table.

In architecture and interior design, this illusion can be used to make cramped spaces seem bigger. Many interior designers use mirrors to create the illusion of a room being larger than it really is.

APPLICATIONS

Magic tricks, interior design

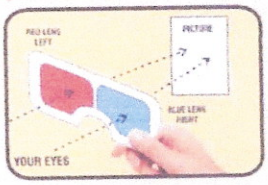
Expectations

Relative Size

EXHIBITS ABOUT
Perception

Stereo Vision

Two eyes give us the ability to perceive depth.



Use the colored glasses to look at the framed images. Be sure to have the red lens on the left and the blue on the right.

What's going on?

Humans have two eyes located side-by-side in the front of their heads. Thanks to the close side-by-side positioning, each eye takes a view of the same area from a slightly different angle. The two eye views have plenty in common, but each eye picks up visual information the other doesn't. The small differences between the two images add up to a big difference in the final picture. It is a 3-dimensional stereo picture. We need this ability to catch a ball, navigate streets, drive a car, etc.

In this exhibit, two slightly different images are superimposed over the other, representing two eye views. For the left view image, the red component of the image is filtered out. For the right view image, the blue component is filtered out. When you wear the glasses, your brain is tricked to seeing two views, and it combines the views to make a 3-D image that seems to have depth.

APPLICATIONS

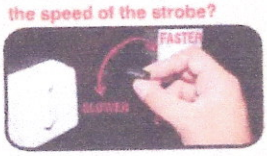
Geology, entertainment, sports

Head on a Plate

EXHIBITS ABOUT
Perception

Strobe Light Carousel

Can you animate the figures on the carousel by controlling the speed of the strobe?



- **Turn on the fan using the left switch.**
- **Turn on the strobe light using the right switch.**
- **By rotating the center knob, you can control how fast the light flashes.**

What's going on?

A quick flash of light can seemingly freeze fast-moving objects

This exhibit uses the phenomenon called ***persistence of vision***, the ability of the human brain to retain a visual impression for a fraction of a second.

The strobe light briefly illuminates the scene and then quickly turns off. This has the effect of seemingly freezing the scene, permitting our eyes and brain to retain a brief visual impression. By varying the speed of the strobe, you can synchronize the strobe light to the speed of rotation of the carousel. Once you find the right strobe light speed, you will see the figures move in an animated fashion.

APPLICATIONS

Motion pictures, photography

Stereo Vision

Exhibits on Mathematics

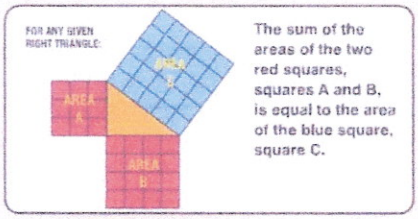
Hyperbolic Slot

EXHIBITS ABOUT
Mathematics

Pythagorean Theorem

Use the puzzle pieces to make 2 small squares or 1 big square.

Do the pieces from the two smaller squares all fit into the bigger square?



The sum of the areas of the two red squares, squares A and B, is equal to the area of the blue square, square C.

APPLICATIONS

Geometry, land measurement, height measurement

What's going on?

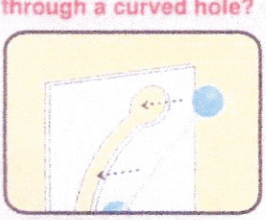
The Pythagorean Theorem is a statement about triangles containing a right angle. This theorem may have more proofs than any other theorem (over 350!).

This exhibit visually shows that the biggest square has the same area of the two smaller squares added together. The triangle is the yellow shaded area in the center.

EXHIBITS ABOUT
Mathematics

Hyperbolic Slot

Can a straight rod pass through a curved hole?



Slowly turn the base and try to pass the rod through the curved slot.

APPLICATIONS

Industrial design, Astronomy

What's going on?

Yes, the straight rod can pass through the curved hole.

In this exhibit, the steel rod traces out the surface of two cones as it rotates on its vertical axis. The acrylic plate acts as a plane intersecting these cones through this vertical axis. Because the rod passes through the plate at an angle, the path that the edges of the rod makes through this plane is not straight but rather curved. This curve is called a **hyperbola** and is the exactly the same shape as the slot. This is why the straight rod is able to pass cleanly through even though the slot is curved.

EXHIBITS ABOUT
Mathematics

Whirlpool Section

Spin the base of the container containing the fluid as fast as you can.

Can you guess what shape the fluid forms into when it is spinning fast?

APPLICATIONS

Liquid mirror telescopes

What's going on?

When you spin the container, the fluid inside is subjected to a centrifugal force. This force, along with gravity, makes the surface of the fluid take the form of a **parabola**.

All spinning liquids subjected to gravity and a centrifugal force forms a parabolic surface of revolution. Scientists have put this phenomenon to good use in the construction of telescopes. Parabolic mirrors are ideal mirrors for telescopes because of their ability to focus light rays to a single point, but parabolic mirrors are very difficult to make. Using the element mercury, scientists have made rotating liquid mirror telescopes, using the power of the parabola in good use in making telescopes.

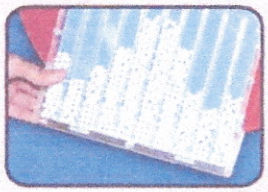
Pythagorean Theorem

Probability Machine

EXHIBITS ABOUT
Mathematics

Probability Machine

Collect all the small balls into the upper side of the machine. Then, tilt the machine so the balls fall downward into the row of metal rods.



What shape is made by the balls under the metal rods?

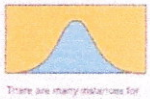
APPLICATIONS

Geometry, land measurement, height measurement

What's going on?

The shape made by the balls when they fall into rods is called a bell curve (because of the shape) or normal distribution.

The bell curve shows that it is more probable for the balls to fall into the middle area of the rods rather than into the sides. The number of balls collected in the middle of the probability machine shows this.

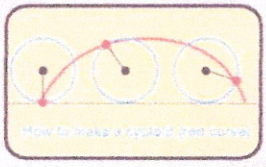


There are many instances for the bell curve that occur in our daily lives. For example, test scores for an exam can approximate a bell curve, some biological variables such as weight and height in a given population, and many chance experiments (such as coin tosses) all exhibit a normal distribution.

EXHIBITS ABOUT
Mathematics

Cycloid Racer

Which marble will win, the one rolling down the shorter straight track or the one rolling through the longer curved track?



Put a ball into the launching pad of each track. Using the flap, release the balls to go down the slope.

APPLICATIONS

Design of roller coasters, Atomic physics, Electronics

What's going on?

A cycloid is the curve defined by a fixed point on a wheel as it rolls in a straight line. The curved track used in the exhibit is half of an upside-down cycloid.

The upside down cycloid is the curve of fastest descent under gravity.

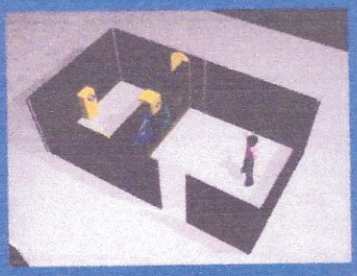
Even with the cycloid track having the longer distance, the ball rolling down its shape beats the marble rolling down the shorter straight track.

The cycloid accomplishes this because it maximizes the acceleration of the marble. The steeper angle of entry imparts a greater acceleration than the straight slope.

Cycloid Racer

Thematic Exhibits

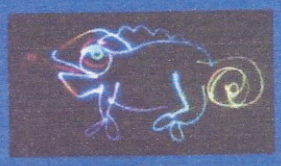
thelearningspace



Light Doodles

Children make doodles using light sources such as fleshlight and colored penlights. A digital camera captures all the light movements and then displays them. A timer helps the kids know how long to make a doodle.

Light Doodles



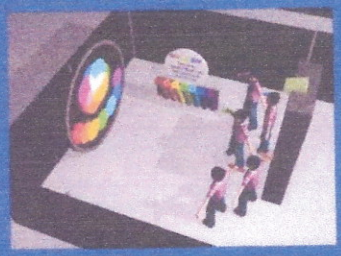
Sample doodles

Seeing Sound

Children can see sound waves as they pass through a tube with a layer of small styrofoam balls. Preset waves that can generate one, two or three distinct waves will be available at a touch of a button. The child can also experiment how volume affects the apperance of the sound waves.

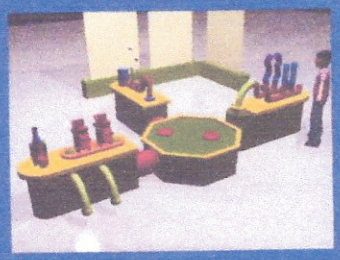
I Drink Science

The process of bringing powderd milk to your home is presented interactively by this exhibit. The exhibit utilizes creative use of buttons and levers to make animations respond to input. For example, kids can milk a virtual cow using "udder"-shaped buttons, while a pail fills up with milk in the monitor. Other activities are: adding vitamins to the milk (buttons), applying heat (rotary swith), squeezing a lever to homogenize milk, and browsing video files of the powder making process.



Light Spectrum

Children learn how colors of light merge to create new colors, and to make the color white. Children use colored flashlights to control onscreen circles that overlap and mix. This is a dark room exhibit.



Air Power

Children harness the power of air through the use of several activities and different setups: they can make electricity by making windmills turn, they can make sound by blowing air through a whistle, they can make small fabric air dancers lift and dance, they can make small styrofoam particles behave like a fountain, and even make small disks hover and glide.

Inertia Lab

What happens if you strike a box with a fragile egg on top? Will the egg fly away with the box or get dunked onto the glasses of eater below? Children learn about the principle inertia in this exhibit.

Water Cycle

The water cycle is a vital cycle of nature that we need to preserve. Children draw up water from a well to use. The water flows into lakes and rivers. The children then make clouds using the cloud generator. By pulling on a string, they make rain, thus retruning eater back to the earth. The water table be seen being replenished by the rain.

Animation Station

Children make stop-motion animations using letters, numbers and shapes. A camera controlled by a button takes a picture of whatever is in the stage. The software program then runs the pictures in sequence to make the animation.

Ball Fountain

Children play with balls as they float on air provided by outlets embedded on the floor.

Funny Faces

In this exhibit, children can play and distort with images of their faces using a virtual funny mirror. They can make themselves look like a chipmunk, an ogre, atwo-headed monster or one without.

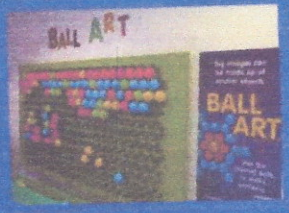
Body Paint

Using body movements, children can paint colorful pictures as silhouettes of their figures are captured over time.

Ball Blaster

Children can blast balls into a target with the ball blaster. Balls are sucked into the cannon from below following Bernoulli's principle. A continuous flow of air flings the balls onto the targets.

Ball Art



Children can make beautiful patterns using colored balls and a grid with this exhibit.

Dino Topple

Children learn about cause and effect with Dino Topple. Like dominoes, the dinosaur's scales follow when the first one falls.

Gravitram

Spin Table