I'm a Scientist!

8-25-15 10:47am
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The Mobile Interactive Science Exhibit

Mrs. Leilani S. Cunanan, CESO VI
Division Superintendent of Angeles city
Angeles City, Pampanga

Madam,

Mabuhay!

*This is to request from your good office an endorsement and permission to promote and bring the "I Am A **Scientist! Mobile Interactive ScienceExhibit**" to the schools. The goal of the exhibition is to promote science Appreciation among students in elementary and high school because science remain as one of the important prerequisites to nation building. And to help teachers reach science, we need our students to learn science appreciation.*

This mobile exhibit, launched July 2003 was designed to inculcate science awareness, appreciation and application to students and laymen through interactive exhibits right to your door step.

*As of present, **"The I Am a Scientist"** travelling exhibits have reached more than 350,000 elementary and high school students. The exhibits have toured various regions throughout the country, including improvised areas. With the mission of bringing the fun science to classroom we able to create learning environment where science concepts are discovered in an entertaining way of imagination that capture the heart of your minds.*

"GET INVOLVED IN CREATING OUR FUTURE SCIENTIST"

We look forward for your response & support for the year 2015 - 2016. More power and God bless.

Sincerely yours,

Ms. Lorna A. Quinonez
Exhibitor

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The
Mobile Interactive
Exhibit

MR. RIZALINO JOSE T. ROSALES
REGIONAL DIRECTOR - OIC
DepEd Region III
Maimpis, City of San Fernando , Pampanga

DepED R.O. III
AUG 07 2015

Dear Sir,

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Exhibits

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Division Advisory No. 51, s. 2015

This **ADVISORY** is issued for the information of the Schools, Officials and Personnel. Strict compliance with Regional Memorandum No.130,s. 2014 is hereby enjoined, citing item nos. 1 to 5, requiring the schools to evaluate said programs/projects.

LEILANI SAMSON CUNANAN, CESO VI
Officer In Charge
Office of the Schools Division Superintendent

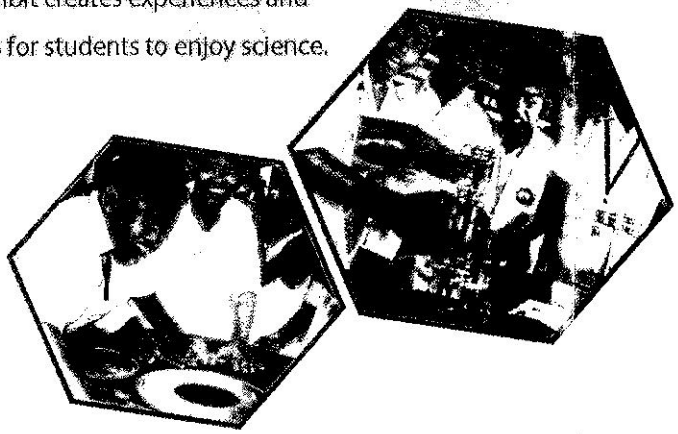
DepEd Region III Referral No. _____, s. 2015

Respectfully referred to the Schools Division Superintendents, enjoining evaluation of this subject request in accordance with DepEd Order No. 8, s. 2013, "Policy Guidelines on Regulating the Issuance of Gods and Services" and Regional Memorandum No. 130, s. 2014 entitled "Issuance of Advisories on Goods and Services".

RIZALINO JOSE T. ROSALES
Officer-in-Charge
For the Regional Director

Entertaining science

The I'm A Scientist Mobile Interactive Science Exhibit creates experiences and opportunities for students to enjoy science.



Creative multimedia exhibits

We create highly visual, colorful and well-crafted exhibits. We employ graphics, computer software, and the latest technology to present scientific phenomena in the best way possible.

[illegible]

We have over 14 years of experience in exhibit design and fabrication. We continually add to our exhibit menu to give you fresh and innovative exhibits

I'm a Scientist!

The
Mobile Interactive
Science Exhibit

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I'm a Scientist

mobile interactive science exhibits

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Animation Station

When you see a series of still images, you see some interesting effects.

To Do and Notice

Position the objects on the table under the camera. Look at the monitor to make sure the objects are framed properly. Click on the "GRAB" button to take a picture of each position. Move the objects a little bit each time you click on the "GRAB" button. Finish the sequence and watch the playback of your animated movie. You will see a smooth motion of the objects as if they move on their own.

What's Going On?

The human brain retains a visual impression for about 1/30th of a second. This ability to retain image after it has been removed from view 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 30 pictures a second, your brain remembers the last frame long enough to give you an illusion of a smooth motion. You have created a simple animated movie.

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

In television screens, a very fast dot of light is sweeping the screen from top to bottom, left to right. Even though only a small image is shown at a time, the succession is fast enough for your brain to compose a complete image.

You can also experience persistence of vision when passing by a house with a picket fence. When you pass by fast enough, the fence becomes a blur and you are able see the whole house clearly.

Chaotic Pendulum

Chaotic systems depend heavily on starting conditions.

To Do and Notice

Inside the case are two identical pendulums. Each pendulum is composed of a system of four pendulums attached to each other. Try to make the movements of the two pendulums as similar as possible by turning the knobs and releasing them at the same time. Notice that no matter how careful you are to start them the same way, each pendulum will still move differently than the other.

What's Going On?

The motion of a single pendulum is simple and easy to predict. This exhibit shows what happens to a large pendulum when smaller pendulums are attached to it. Notice that in addition to the main pendulum, there are three smaller pendulums connected at its ends. Each of these pendulums influences 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 way each time you try to start it. Even 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 characteristic of chaotic systems.

Chaotic systems exist everywhere in nature. The most obvious is the weather, where small differences in air pressure, temperature, humidity and other environmental factors can have significant influence on its overall outcome. Other examples of chaotic systems are fires, stampedes and riots, and disease outbreaks.

Cloud Rings

Create beautiful cloud patterns.

To Do and Notice

Press the button for a few seconds. A humidifier produces mist that collects on a diaphragm inside the table. When enough mist has accumulated inside, press the table top with a quick and even motion. Watch as cloud rings form from

the hole at the center of the table. Experiment making different cloud shapes by varying the way you press on the table.

What's Going On?

A humidifier produces mist that collects in the membrane inside the table. When you push the table, the membrane is compressed and forces out the cloud of mist on 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.

A vortex is a mass of gas or liquid swirling rapidly. Tornadoes, whirlpools and typhoons are examples of vortices that form in nature. Vortices can be harmless and beautiful like smoke rings, or violent and destructive, depending on what they are made of and how they are created.

Colored Shadows

Red + Green + Blue lights produce white light.

To Do and Notice

Three sources of light in the primary colors (red, green and blue) are shining down on a white surface. Notice the boundary of each colored light and what colors are formed when two of them overlap. Place your hand at different areas on top of the white surface and observe what colors are formed by the shadows of your hand. Try to figure out which combination of colored lights produced the colors you see. Press the switch to turn off a particular light and discover the result of combining any two colored lights.

What's Going On

The combination of red, green and blue lights produces white light which you could see on the table surface where the three colored lights overlap. By blocking one of the sources of lights, the other two lights will show you what color is made by their combination. For example, if you block the red light, the green and blue light produces cyan colored light. Cyan is the complementary color of red. It means that if you combine red with cyan light, you will produce white light. When your hand's shadow blocks one of the lights, the colored shadow produced is the complement of that color. If you block the green light, red and blue produces its complement magenta. Red and green produces blue's complement yellow. If you place your hand on the white area where the three lights overlap, all colored lights are blocked and the result is a black shadow.

Using the switches produces the same results by turning off one of the lights and examining the color where the two lights overlap.

This process of combining red, green and blue lights is the basis of how modern colored televisions work.

Coupled Pendulum

To Do and Notice

Make sure that the two pendulums are at rest. Gently pull one of the pendulums and release it. Observe the second pendulum begin to swing slowly until it catches up to the second pendulum. After some time, the first pendulum slows down and briefly comes to rest. It then begins to swing again slowly and to catch up on the second pendulum.

What's Going On?

A simple pendulum is a weight suspended by a string or a thin rod that swings back and forth when given an initial push. The speed of its back and forth movement called period, depends on the length of its string. The longer the string, the longer it takes for one complete swing.

In this exhibit, two pendulums are both connected across the suspension string tied to two posts. When you swing the first pendulum, it lightly pulls on the suspension string, 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.

It only takes a small effort to swing a pendulum if you lightly pull or push it at the right time. You may have observed this in the playground when playing with the swing with your friend.

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. What happens is that energy from the first pendulum is being transferred to the second pendulum until the first pendulum is brought to rest. When this happens, it's now the first pendulum's turn to take energy back from the second pendulum.

Since pendulums move at a predictable rate, it was often used in mechanical clocks during the middle ages. However, it was not reliable because of the natural effects of friction, its bulk, and the fact that it can be used in places that move, for example, a boat. Soon, its use in clocks was replaced by other mechanical devices. In the 20th century when man began the exploration of space, principles of the pendulum found important applications in the development of guidance systems for satellites and rocket ships.

Energy Ball

To Do and Notice
Touch the two metal strips at the same time. This will close the circuit and switch on the energy ball. You can also join hands with another person and have each one of you touch each of the metal strips. Keep joining hands with other people to see if it will work with more than two people.

What's Going On?
The human body is a weak conductor of electricity as it is largely composed of water. When you touch both metal strips, you are in fact completing the electric circuit. The electric current pass through your body but it 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 flow through your bodies to complete the circuit.

Energy Needs Work

More power means more effort.

To Do and Notice
Press one of the blue buttons to choose a light bulb to turn on then slowly crank the generator clockwise. Watch as one of the bulbs start to glow. Increase its brightness by turning the crank faster. Try a different button. Notice that when you select on a bigger light bulb, it gets harder to crank the generator. Try and press all the buttons at the same time to know the effort it needs to crank the generator to light all the bulbs.

What's Going On
Inside the generator is a coil of copper wire rotating around a permanent 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.

Notice that when you select a bigger bulb to turn on, it becomes harder to crank up the generator. This is because the bigger bulb has a higher resistance to electric current. If you try to press all the buttons at the same time, it becomes even harder to turn because all the resistance of their bulbs adds up to oppose the flow of electricity. In order to keep all the bulbs glowing, you need to produce more electricity by exerting a lot of effort.

This exhibit demonstrates the importance of wise consumption of electricity. If we think of the bulbs as homes that need electricity, we can easily see its effects in a real world situation. When more people use electricity more than they need to, there may not be enough electricity to meet the demand, resulting in brownouts and power disruptions. Increased electric demand also means that power stations need to work harder and consume more fuel, resulting in increased brake downs and higher electricity costs.

Generator

A magnetic field induces electricity on a conductor.

To Do and Notice

Slowly turn the crank to begin rotating the magnet on top of a coil of wires. When one end of the magnet approaches the coil, the ammeter senses that current is induced and shows the corresponding value of current in milliamperes. As the magnet continues its rotation, the other end of the magnet which has an opposite polarity, also induces current to flow through the wires, but in the opposite direction. This shows in the ammeter as the needle quickly points to the other side of the scale. Experiment with different speeds of turning the crank to see if you can produce a higher current.

What's Going On

When one end of the horseshoe magnet turns towards the coil, its magnetic field induces electric current to flow through the wires. You can visualize it as something like a paddle wheel causing the water in a channel to flow. This effect was discovered in 1831 by Michael Faraday. He noticed that if an electric conductor like a copper wire is moved through a magnetic field, electric current will flow in the conductor. In this exhibit, it is the magnet (and its magnetic field) that move along the wire. 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.

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.

The uses of this principle can be seen in all devices that has electric motors, from toys to power tools and electric vehicles.

Gyroscope

This spinning wheel defies gravity.

To Do and Notice

Hold the handle with your left hand and raise the wheel to a vertical position. With your right hand, spin the wheel clockwise as fast as you could then let go of the handle. Observe the behavior of the wheel and take note of its direction of rotation about the vertical axis. Once the wheel stops, try again but spin the wheel counter clockwise by using your right hand to hold the handle and your left hand to spin the wheel. Notice which way it rotates this time.

You could also try to spin the wheel and let go at about 45 degree angle. See if the wheel could stay at this angle after you release the handle.

What's Going On

A gyroscope is just a spinning wheel but what makes it interesting is its resistance to changes in direction along the plane of its spin. This seemingly strange behavior is explained by one of the laws of motion called inertia.

The law of inertia states that a body in motion or at rest will resist changes to that state. A moving car will want to remain moving straight ahead. It will resist any sudden turns or it will flip over because the mass of the car wants to keep it moving forward. If the car is moving on top of the edge of a very big wheel, it will also resists turning to the right or to the left but would want to move forward along the curve of the wheel.

In this exhibit, the gyroscope is suspended at one end. Gravity tends to pull the other end downward. What gravity is trying to do is change the angle of the plane of the wheel's rotation, like trying to change the direction of a moving car. However, the wheel's rotational inertia is greater than the pull of gravity, it resists turning and stays at the angle it is spinning. For gyroscopes, the greater the weight at the edge and the farther it is from the axle, the greater will be its rotational inertia.

Soon, the wheel slows down because of friction and the rotational inertia becomes weak enough for the wheel to start falling on its side.

The wheels of a bicycle are a form of gyroscope. The gyroscopic effect is what makes the bicycle stand up while moving, since falling would be trying to change the direction that the wheel is spinning which is upright. That is why it is easier to balance when the bicycle is moving fast. For experienced riders, they can even let go of the handle bar without falling.

Gyroscopes are used to provide a stable reference point for a vehicle that moves in all directions, that's why they are used as navigational instruments for airplanes and rocket ships.

Hand Battery

Your body can produce electricity.

To Do and Notice

Place each hand firmly on the copper and aluminum plates. Observe the ammeter and take note of the reading. Let another person try and see which one can produce a greater current. Notice any difference between you hands and those of the other person.

What's Going On

When your hands touch the copper and aluminum plates, your body acts like the acid in a car battery. A chemical reaction happens when your left hand, which is damp and salty, touches the copper plate. 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 when your skin is moist. However, the electricity that flows through your body from this battery is very small so that you cannot feel it.

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, completing the electric circuit.

Damp hands increases the electricity produced because the moisture improves electrical contact with the plates and also improves the chemical reaction between the hands and the metal plates.

Hyperbolic Slot

A straight rod can pass through a curve slot.

To Do and Notice

A metal rod is fixed on a rotating vertical axis at an angle of 45 degrees. A sturdy plastic panel with a curved slot stands directly in the path of the rod as it spins on its axis. Hold the base of the rotating platform to spin the rod and gently turn it to make the rod spin on its axis. Watch how the rod is able to pass through the curved slot.

What's Going On

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 it even though it is curved.

This exhibit displays one of the basic aspects of geometry called conic sections. A cone is a three dimensional shape that is like a pyramid but circular. It is round at its base and tapers to a point at the top. If you cut this cone at different angles, you will observe different shapes if you look at it from the top. A hyperbola is one of the shapes of these conic sections.

Infinity Mirror

To Do and Notice

Turn on the light switch and look into the hole on the front mirror. You will see the pattern reflection being repeated into infinity towards the center of the mirror. Small lights around the edges of the mirror enhance this illusion. Hold the edge of the front mirror and gently twist it. You will see the pattern of reflection becomes curved towards infinity.

What's Going On

The image reflected by the first mirror is reflected off the second mirror towards the first and so on to infinity. You can see this as an endless recession of reflections towards the center. According to the law of 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.

A type of laser uses repeated reflection to amplify the intensity of light. In a ruby laser, light is excited in a rod of ruby crystals by applying a current though it. At the ends of the ruby rod are mirrors that reflect the light back and forth making it more intense. One of these mirrors is only partially reflective, so that when the light reaches the right intensity, it emerges out of this mirror in the form of a laser beam.

Invisible Strings

Make music by playing the invisible strings of a harp.

To Do and Notice

On the top and bottom of the c-frame, you will see eight pairs of holes. Each pair represents the "strings" of a harp that you can play by moving your hand across them. Each pair also corresponds to a single tone of the musical scale. Use both hands to play the harp and try to play a simple melody.

What's Going On

Each invisible string is actually a laser beam directed towards a hole at the bottom of the harp. Inside a 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. The sensors are placed at the bottom of the hole so that natural light would not reach it and only one source of light can affect it. A weak 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.

Light activated switches are used in lamp posts, burglar alarms and factory machineries. Lasers exist in a variety of colors and intensity. They can be generated powerful enough to cut steel or used harmlessly in light shows and electronic devices.

Magnetic Fields

See the magnetic lines of force using iron particles.

To Do and Notice

Inside the acrylic dish are fine iron particles suspended in a thick clear liquid. Put one of the bar magnets on top of the acrylic dish and observe the iron particles align themselves to the magnetic field of the magnet. Take note of the shape it makes especially at both ends. Get the second magnet and position the two magnets on the dish such that like poles are placed end to end. You will feel the magnetic repulsion between them. Observe the shape of the iron particles inside the dish to see how the magnetic fields of the two magnets interact.

What's Going On

In this exhibit, we can see the magnetic lines of force in two dimensions. 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. If you place two bar magnets end to end try to bring two like poles together, you will see from the shape formed by the iron fillings, how the magnetic fields try to repel one another.

Magnetic Levitation

To Do and Notice

What's Going On

All magnets have two poles, the north pole and the south pole. Opposite poles attract and similar poles repel each other. The exhibit setup on the right has magnets that are arranged on top of each other. The red magnets expose the south poles, while blue magnets expose the north poles.

The magnets are arranged in such a way that the like poles (like colored magnets) are on top of each other. Since like poles repel, the magnets push the ones at the bottom and on top of them, keeping themselves apart and making them "float". If you press the magnets down, you can feel the force pushing the magnets back up.

The exhibit on the left 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 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.

The fundamental nature of magnets has very common and practical applications in our everyday lives. Electric motors spin because of magnetic repulsion and attraction. Special trains that use magnetic levitation are now being developed in countries like China, Germany and Japan. Because these trains float on their tracks, they can travel much faster and more quite than ordinary trains.

Magnetic Lines of Force

To Do and Notice

Observe how the compasses initially align their pointers to the north pole of the earth. Bring the bar magnet closer and see how the pointers now spin towards it. Hold the magnet just above and center of the exhibit and follow where all the compasses are now pointing.

What's Going On

A compass consists of a magnetized needle that is free to rotate and align itself with the Earth's magnetic field. When you place the bar magnet far from the compasses, they will 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 repulsed by the north and south poles of the magnet. Try moving the bar magnet slowly across the surface and let the compass needles follow the magnetic lines of force from the bar magnet.

Compasses are one of the early practical applications of magnetism, and still remains one the most basic aids in navigation and air travel. The discovery of Michael Faraday that the movement between a conductor and a magnetic field produces electricity led to the development of most electrical applications we know today.

Magnetic Pendulum

To Do and Notice

Swing the pendulum gently. Hold on the black table and slowly turn until one of the magnet clusters is under the pendulum. The magnets are colored according to what pole is exposed. Different colored magnets means opposite poles are facing each other. Observe the behavior of the pendulum when it is above each of the magnet clusters. You can also influence the pendulum movement by slowly turning the table back and forth.

What's Going On

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

Magnets have a lot of practical uses. It is a vital component in speakers, computers, medical equipment, radars and other electronic equipment. The attractive and repulsive force in magnets is what makes electric motors spin.

Mirage

To Do and Notice

Stand about one and a half feet away from the exhibit. Look closely at the object on top of the exhibit. Try to touch it. What happens?

What's Going On

Two concave mirrors are set facing each other, like a wok pan with cover. There is a hole on the top mirror and an object is placed inside at the bottom. The reflection that you see at the top of the exhibit is called a virtual image. The exhibit is able to make this illusion because of the shape of its mirrors. The cross section of each mirror is the shape of a parabola. This shape concentrates reflections on its surface whether light, sound or radiation on a point above the surface called the focus. The mirrors are of parabolic shape all around, they are parabolic dishes. The object at the bottom mirror is reflected off the top mirror and again reflected at the bottom mirror. The reflection from the bottom mirror coincides at the focus at the top of the exhibit. Since the object is reflected all around, the resulting virtual image looks three dimensional.

Parabolic dishes are extensively used in radars, as satellite dishes, and as parabolic antennas. The reflecting property of this shape allows antennas to detect very weak signals because signals striking its surface concentrate at its focus where the signal detector is located.

Pin Screen

Make an image of yourself in three dimensions.

To Do and Notice

Reset the pins by pulling back the top frame. The screen will turn to the horizontal to put the pins back in the starting position. Bring the screen back to the upright position and slowly push your face towards the pins. Slowly let the pins make an impression of the contours of your face. Step back and turn the exhibit around to see an image of yourself made by hundreds of pins protruding at varying lengths according to the contours of your face. Repeat the process but use your hands or objects to make an impression and see if you would easily recognize the image formed at the back.

What's Going On

The exhibit consists of hundreds of movable pins that are spaced close to each other. Each pin follows the contour of the object pressed against it at the back of the frame. The combination of the protruding pins makes a relatively smooth sculpture-like image of the object that the viewer can easily recognize. The protruding pins also cast shadows that further enhances the three dimensional effect.

Plasma Sphere

To Do and Notice

Turn on the switch at the base of the sphere. Observe the behavior of the charged gases inside. Lightly touch with one finger the glass sphere and see how the charges concentrate on the tip of your finger. Be careful not to touch the glass too long because it will feel very hot soon.

What's Going On

A transformer connected to the small sphere at the center of the glass ball collects negative charges. Since like charges repel each other, these negative charges jump off the sphere in all directions as they try to go where there is no build up of charge. These charges want to be grounded or pass through the earth. What makes them visible are the presence of special gases in the sphere. Inside the glass are inert gases like argon, neon and nitrogen that glows with red, blue and white colors as the electric charges pass through them. These electric charges continue to go out of the ball and to earth. It is only the gases that are trapped inside. Now, the human body is a better conductor of electricity than air. When you touch the glass, these electric charges finds the easiest path to earth through you and so instead of spreading all over the plasma ball, the electric charges all go to your fingertip, flow though your body and down to the ground.

A fluorescent light bulb works with the same principle. This type of light bulb has mercury gas trapped inside. The glass inside the tube is coated with a phosphorescent material. When electric charge is applied to the bulb, the atoms of the mercury gas gets excited which in turn causes the phosphorescent coating to glow.

Polarized Light

To Do and Notice

This exhibit consists of two polarizing lenses aligned parallel to each other with a strong light source at the back. The first lens can be rotated to observe the behavior of light passing through. Turn the lens so that you are able to see most of the light coming from the back. In this position, the polarizing filters in the lenses are parallel to each other. From this position, rotate the first lens 90 degrees. You will see that most of the light from the back will not be able to pass through.

Maintain this position and take one of the plastic pieces and hold them between the lenses. Gently bend it and observe the behavior of the light passing through it. The areas where light is visible on the plastic are where the stresses are strongest.

What's Going On

When light is emitted from sources like light bulbs, this light is unpolarized, that is, light waves are vibrating in all directions. Polarizing filters will block light waves that are not oscillating in the same plane as the polarized lens' orientation, but only those that are vibrating in the polarizing direction will be transmitted. You can see through the filter lens but it is slightly dim because not all light could pass through. The light that passes through is called polarized light.

If a second polarizing lens is placed behind and oriented 90 degrees from the first lens, then all light will be blocked and you will not see anything through the lenses.

Plastics under stress will twist polarized light at different angles depending on the amount of stress. Many industries use this to locate stress points to help them prepare better designs for their products.

Pulleys

To Do and Notice

Put a rubber band around the big wheel at the center and connect it to one of the smaller wheels. Slowly turn the big wheel and take note of the difference in their speeds and the effort it takes to turn them. Try connecting them to several wheels and notice how harder it takes to turn them all. Try different combinations and observe the results.

What's Going On

A pulley is a wheel with a groove along its edge for holding cable. 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 belts so that the direction at 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. Notice also that it slightly harder to turn a smaller wheel than a big wheel because its edge is near to its center. According to the formula of work which is W=Force x distance, if the distance (to the center) is short, you would need a larger force to get the desired amount of work. Conversely, a bigger wheel would require a smaller amount of force to turn.

This system of belts and pulleys is commonly used in connection with an electric motor, in situations where a rotational action is needed to power another machine or to vary the speed of rotation of this second machine. There are a lot of applications of this system in our surroundings. You can see this in water pumps, car engines, generator sets, factory machines, cassette players and manual sewing machines. This system is also similar to the driving mechanism in your bicycle although instead of a belt and pulley, a chain and sprocket is used.

Shadow Kaleidoscope

To Do and Notice

The Shadow Kaleidoscope multiplies the image reflected between the two mirrors. An object is placed at the center of the mirrors to easily identify the number of reflections. Markers are placed at the base to indicate the angle between

two mirrors. Start by positioning both mirrors at the 0 degree markers on either side of the base. Slowly bring the two mirrors, stopping on each succeeding degree marker. With each stop, take note of the number of reflections the object makes on the mirrors. You will discover that the closer the mirrors, the more reflections are made.

What's Going On

Light rays bounce off each mirror at the same angle that they hit the mirror. The angle with which light hit the mirror is called the angle of incidence, and the angle it bounces off is the angle of reflection. When the angle between the mirrors is small, so too are the angles of reflection and incidence. Light is then able to bounce off back and forth more frequently and fit within the width of the mirror. The result is that you see more images.

The principles of reflection is used in situations where light is needed to be bent before reaching the observer. Periscopes and single reflex cameras are examples of this. In fiber optics, a very thin glass fiber is used to transmit light from one end to another over very long distances. This works because inside the thin glass fiber, light is repeatedly reflected along the inside walls until it reaches the end of the fiber without much loss of energy.

Spinning Discs

Take your eyes for a spin and see things differently.

To Do and Notice

This exhibit demonstrates how moving patterns affect our visual perception. There are three patterns that allow you to experience a particular aspect of vision namely color, depth and __ perceptions.

Disc 1: Benham's Disc

To Do and Notice

Observe that the pattern is just black and white. Spin the pattern and stare at it for a few seconds. Notice that you will begin to see different colors along the thin strips.

What's Going On

Looking at this spinning pattern will make you see different colors instead of the black stripes. This effect is caused by the way nerve cells in your eyes that respond to colors are affected by the spinning pattern.

Nerve cells that respond to color are called cones. There are three types of cones - one the respond to red light, one that respond to blue and another that respond to green light. These types of cones also have different latency times, the time that it takes for it to respond to a color. They also have different persistence of response times, the time it keeps responding after the color is removed from view. Of the three types, blue cones are the slowest to respond and longest to keep responding.

The spinning pattern lets you see rapid flashes of black and white strips. Since the strips are of different lengths and different positions along the disk, the result is that some strips move faster or longer than others. The varying rate of responses of the cones partly explains why you see different colors along the disk.

Disc 2: Depth Spinner

To Do and Notice

Spin the pattern and stare at it for about 20 seconds. Turn your eyes and stare at another object in your surroundings. You will see that objects are moving away from you for a few seconds.

What's Going On

When you stare at this pattern for some time, and then look up, it seems everything is moving towards or away from you. This happens because the spiral pattern affects the nerve cells in your eyes. Your visual system has nerve cells that respond to outward motion and nerve cells that respond to inward motion. When you stare at the spinning pattern, one of these nerve cells gets tired and sends weaker signals to your brain. For example, if the spiral Is spinning towards you, the nerve cells that respond to outward motion get tired. If you immediately look up, the opposite nerve cells will give stronger signals and will make you see things moving away from you.

Vortex

I'm a Scientist! The Mobile Interactive Science Exhibit

The Scientist's Trail

Exhibit Detective!

Be a good scientist! Try to answer the following questions as you take your exhibit trip.

Find out which exhibits feature the following scientific phenomena or terms:

	Exhibit Name
Centrifugal forces	
Parabolic mirrors	
Persistence of vision	
Body conductivity	
Hyperbola	

Try to find out:

1. Which falls faster in a parabolic vortex, a one-peso coin or a 25-centavo coin?

answer:

2. What color do you get when you have only red and blue lights?

answer:

3. Why does the gauge in the Generator exhibit swing left and right?

answer:

4. Which state of matter occurs most in the whole universe?

answer:

5. Using the kaleidoscope exhibit, how many red ball reflections are made when the angle is 90 degrees between the mirrors?

answer:

Which exhibit did you like the most, and why?