



MATHEmagic

“LIVING N BREATHING IS MATHS”

The logo features the word 'MATHE' in a bold, white, sans-serif font. The word 'magic' is written in a stylized, yellow, cursive font with red outlines and several yellow stars integrated into the letters. The entire logo is set against a dark blue background with faint mathematical formulas. The logo is framed by a purple and red oval shape. The background is decorated with colorful, flowing ribbons in shades of red, orange, yellow, green, and blue.

An exhibition where adults and children
can learn while playing



Mathematics and physics are fascinating not only for their beauty, but also because they are a way of describing reality and understanding the world.

An exhibition that awakens the amazement of adults and children, making them understand why things happen, **making them happen!**

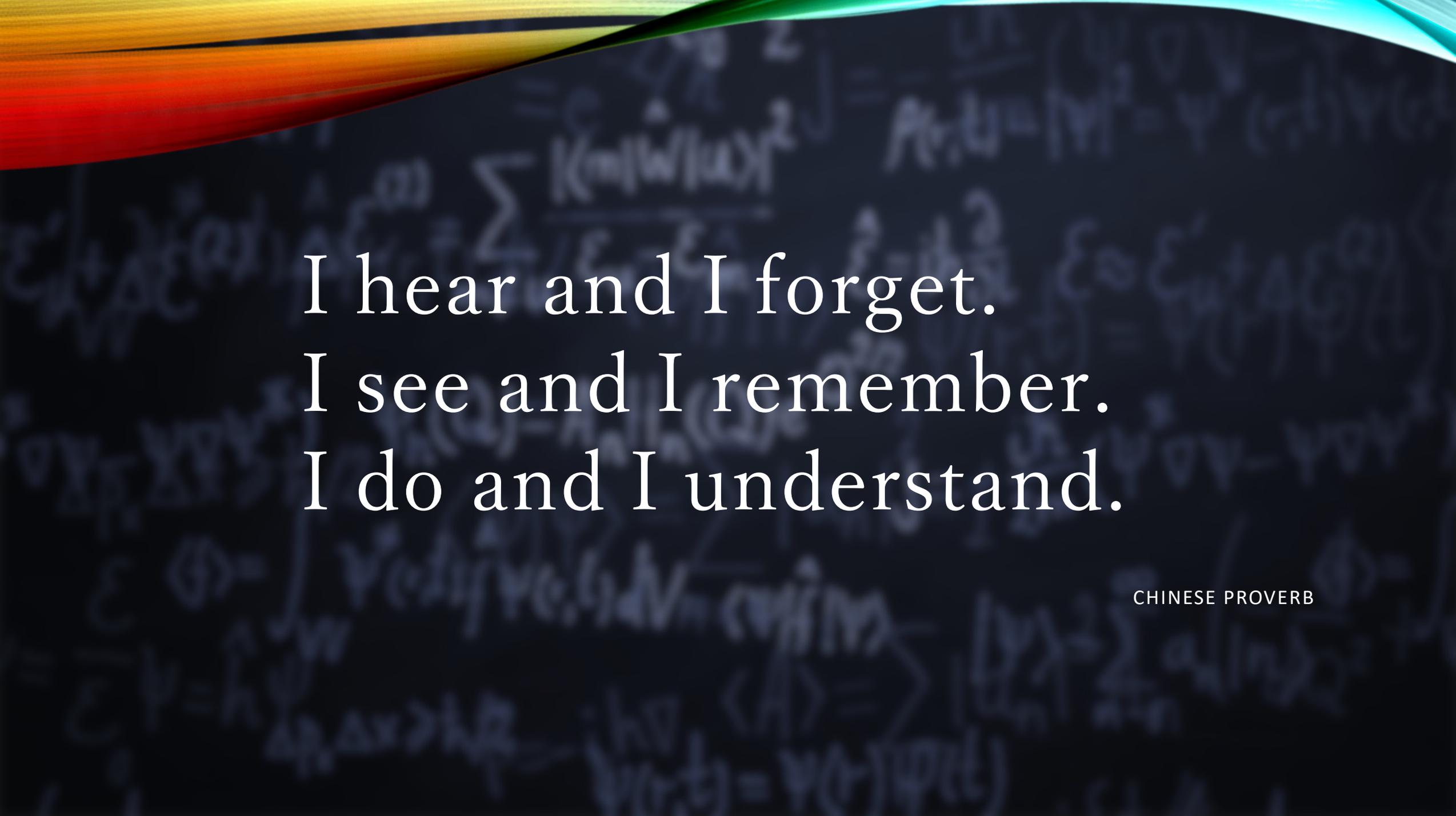




Through the interaction with elements of the exhibition, visitors can know, experience, feel, question and explain.

Lifting a great weight with the help of a giant lever, experiencing the centrifugal force when turning at great speed, becoming a giant or a dwarf and pedaling on a tricycle of square wheels! are some of the activities that this exhibition offers, allowing visitors to get hold of physical phenomena and link them to their daily lives.





I hear and I forget.
I see and I remember.
I do and I understand.

CHINESE PROVERB

INTERACTIONS

01 – CATENARY

How is it possible to roll tricycles that have squared wheels?

Two tricycles at the same time can cross this curious track built with a surface of inverted catenaries. The participants take turns and pedal from start to finish, although it is not necessarily a race.



02 - PULLEYS

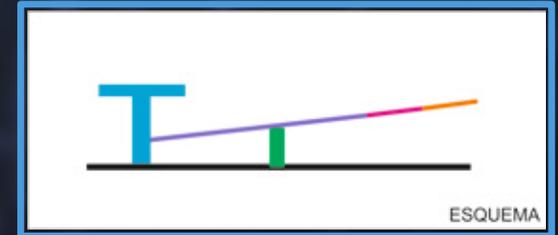
Structure to lift a person (self-executable). The greater the number of pulleys the lower the force required to lift a weight, but the route we have to travel is bigger because more rope is needed.



INTERACTIONS

03 – LEVER

Structure to lift a person (Parents and children). It has 3 levers of different measures linked to a seat. One person sits on the seat and the other person must handle the lever. The longer the lever is the smaller the effort that must be made to lift a weight.



04 – KINETIC ENERGY

Swivel chair and bicycle wheels. Kinetic energy is the one that arises from movement. The Game consists of a platform that is able to rotate without friction around a central axis: for example, a swivel chair. On the said platform, a person holds a bicycle wheel with its axis in a vertical position. If the person turns the wheel of the bicycle, given that the seat-person-wheel assembly is isolated, without forces acting on it, and since a spinning that previously did not occur has now appeared, (the one from the wheel of the bicycle), there must be another spinning that compensates the previous one, that makes the angular momentum remain. What will happen is that the seat will rotate in the opposite direction.



INTERACTIONS

05 – SOLAR ENERGY

This attraction simulates the potential of solar energy through a game with airplanes whose "fuel" is light. This experience allows up to four visitors who, through a system of mirrors, reflect the light that feeds the movement of the aircraft. The game consists of a structure containing 4 planes with solar panels and two reflectors in the upper part. In the base there are 4 mirrors in different positions, which are manipulated by 4 users with the intention of reflecting the light of the reflectors in the mirrors directing the light towards the panels, which makes the planes to start spinning.



06 – GYROSCOPE

Game for 1 person. A spin that seems to spin without meaning. It is a mechanical device that works with an amazing stability: gyroscopic inertia. This phenomenon allows you to play until you get dizzy. It is usually used in instruments for measuring, changing or maintaining orientation in the space of a vehicle. Unfit to go after lunch.



INTERACTIONS

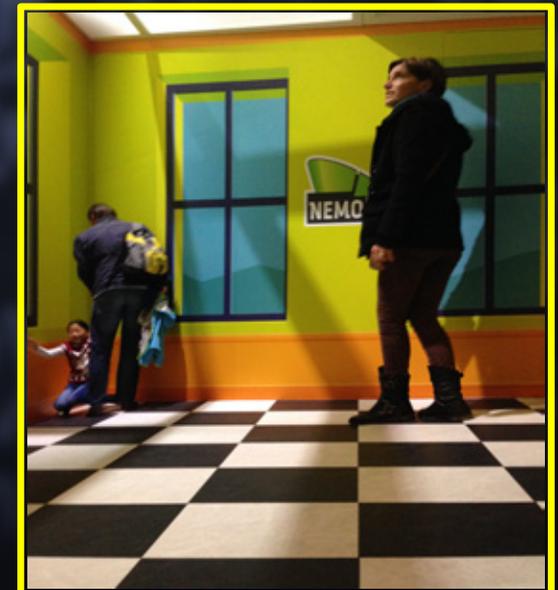
07 – CYCLOID

This attraction has 2 slides with balls and an arrival point. The cycloid is produced when a disc is rolled on a horizontal surface. A point on the edge of the disc describes a curve called cycloid (Greek word meaning circular). Both balls arrive at the same time, regardless of their initial position in the curve. This is the basis of a special type of pendulum in which the period does not depend on the initial position.



08 – AMES ROOM

Distorted room that is used to create an optical illusion. It is constructed in such a way that from the front it appears to be an ordinary room with a cubic shape, with a rear wall and two side walls that are parallel to each other and perpendicular to the horizontal plane of the floor and ceiling. However, this is a visual perspective trick since in reality the room is trapezoidal. The walls are tilted as well as the floor and ceiling, and the right corner is closer to the front observer than the left corner (or vice versa)). As a result of an optical illusion, a person standing in a corner appears in observation to be a giant, while a person standing in the other corner seems to be a dwarf.



INTERACTIONS

09 – PENDULUM

Participatory Sculpture consisting of a self-supporting structure from which hangs 15 spheres in the form of pendulums aligned and regulated in such a way that when they are operated simultaneously, a changing choreography is achieved and generate different figures and continuous movements. The set also allows to experiment in a free and collective way the different possible combinations. The pendulums pass from chaos to perfect alignment, by the effect of a calculation that combines weight with the length of the pendulums.



10 – INFRARED

In this space special lenses allow us to see the infrared radiation that is emitted by bodies that have a certain temperature. Thus, the warmer objects will be seen in one color and the coldest in another. An infrared camera shows the energies of the human body according to the temperature. How do people look like when touching their own heads? And when they kiss another person? In a space that simulates to be a television studio, visitors will make different experiences, while they are filmed by an infrared camera and a common one. In two monitors we see both images. The infrared shows colors according to friction temperatures or actions. In the studio, cold and hot elements will be provided to help people make the different experiences.

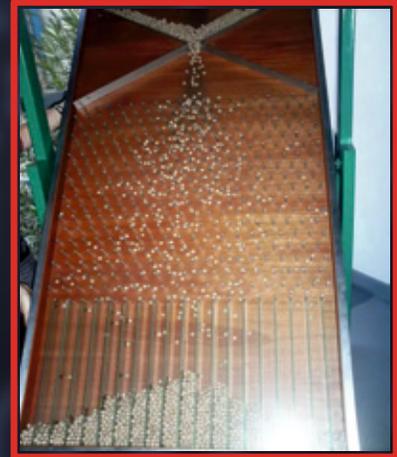


INTERACTIONS

11 –THE GAUSS BELL

This game is a curious device in which a collection of balls descend randomly. Every time a ball reaches a bifurcation, it deviates to the right or to the left with the same probability. The balls are accumulated in the lower part and are drawing a silhouette that, if the number of balls and boxes is large; it starts looking more like a curve, which is called the normal curve.

The structure remains horizontal and the demonstration begins by tilting it with both hands, so that the balls can fall from one half to the other and thus form the bell of Gauss.



12 – HEAD ON THE TABLE

This optical illusion is based on something as simple as controlling the effect of the refraction of light on a set of two mirrors, placed so that it "dodges" the body located behind both.



INTERACTIONS

13 – CENTRIFUGAL CENTRIPETAL

This experience deals with a manually operated device by means of which the phenomenon of centrifugal force can be experienced. To begin with, a lever that produces the centrifugal force inside a strapped tube is manually operated.



14 – VORTEX

A vortex is a turbulent flow in spiral rotation with closed current paths. A vortex can have circular or rotating flows that have vorticity: mathematical concept used in fluid dynamics. It can be linked to "circulation" or "rotation" in a fluid. This type of movement can be found in natural phenomena, such as whirlpools.

This game consists in manually activating a lever that produces the vortex effect inside a tube with liquid.



INTERACTIONS

15 – SOUNDS OF SPACE

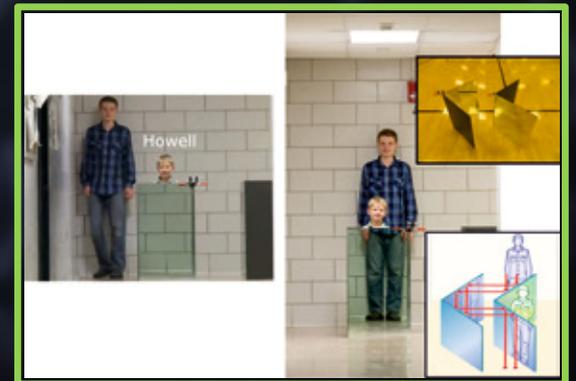
In a vacuum, reality is altered. An alarm clock that sounds and wakes us up in the morning could go unnoticed if we put it inside a vacuum bell. The sound cannot penetrate the glass and “gets locked” inside the bell. It is not the case with light, whose rays can pass through it without problem.

In this attraction you can play with light and sound and their behavior in a vacuum. Sirens that are not heard, balloons inflate on their own and other possible oddities thanks to the absence of matter in space.



16 – INVISIBLE

This optical illusion is based on something as simple as controlling the effect of the refraction of light on a set of four mirrors, placed so that it "dodges" an object located behind both.



INTERACTIONS

17 – FLYING

Another optical illusion that poses a game of perspectives and mirrored walls, that from a certain point of view offers a funny image of a person floating in space.



18 – DRAWING WITH MIRROR

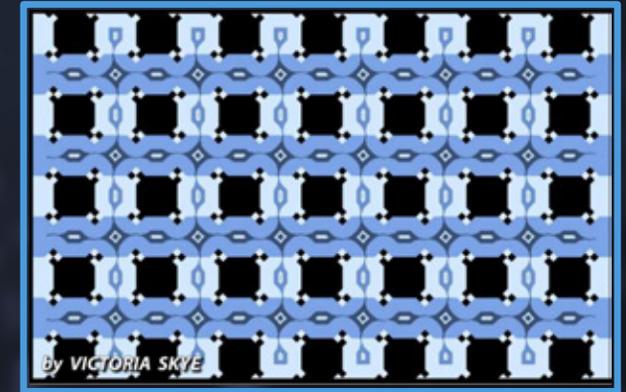
This game has a table with a compartment where we can see a sheet and a paper and in front of it, there is a mirror in vertical position. The participant must write on the sheet without seeing his hands and guided by the mirror. It is almost impossible!



INTERACTIONS

19 – PARALLELS

These are parallel bars: you see them bended by an optical illusion. “Do the horizontal bars look like they bend? Look again because it is not like that. They are straight and in parallel rows. The alternating target patterns, rows and colors all combine to trick your brain” This is the text at the bottom of the optical illusion created by Victoria Skye, magician and artist from Atlanta (United States).



20 – KINETICS

This activity consists in three bulbs and a bicycle, these bulbs are lit up thanks to the energy created by the visitors whilst pedaling the bicycle, the faster they pedal the more bulbs light up. Thanks to a dynamo, mechanical rotation converts in to electricity and lights up lights or store in a battery .

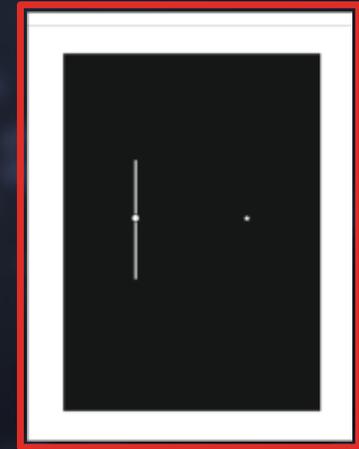


INTERACTIONS

21 – BLIND SPOT

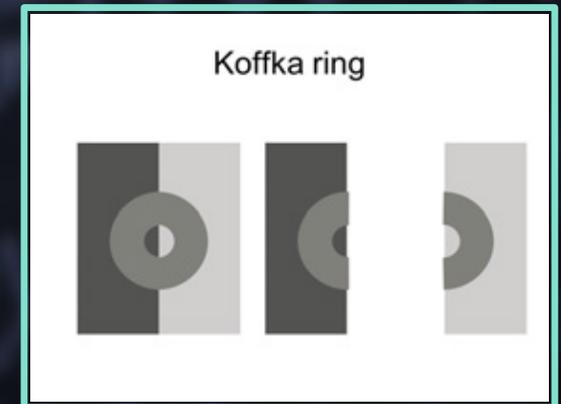
Does the brain draw?

Stand on the mark on the floor. Now close your right eye and look with the left the star to the right of the image. While looking at the star, what happens to the drawing? You can try to zoom out and get a little closer until you see the effect.



22 –KOFFKA RING

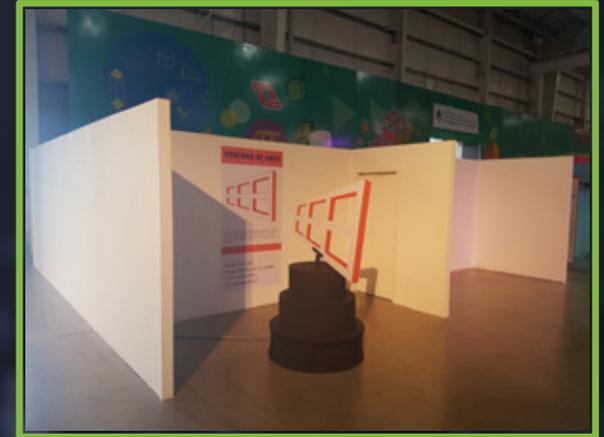
Koffka gave an example of how the simultaneous contrast can be manipulated by changing the spatial configuration. The upper right ring has almost a uniform color. When the stimulus is divided into two, as shown in the upper left, the two half rings appear to have different shades of gray. The two halves now have separate identities, and each one is perceived within its own context.



INTERACTIONS

23 – AMES WINDOW

This experience is about a window and an object that goes through it. The perspective is distorted so that when it rotates it gives the optical illusion that only the object rotates through the window.



24 – TESLA

It is about a machine that stores the electrical load that is produced by the friction of a band on some metal brush hidden inside the sphere, that is hollow and leads the current. By touching it with the hand, we also become part of the "electric circuit", and the static electricity is distributed between the generator and the surface of our body.



INTERACTIONS

25 – THE DIVINE PROPORTION, THE GOLD NUMBER

When you look at a photograph and you find it beautiful ... well there is the number. When you hear a nice melody, there's the number! When you see a beautiful person ... there is also the number! Everywhere! From ancient Greece to the present day, it has worried mathematicians, artists, biologists and all sorts of scientists and creators. What's so interesting? Why does it call our attention so much? We seek together the gold number around us.



26 – TETRIS BATTLE

Board game in which two players participate.

Team: A square 7x7 board - 6 "tetris" tokens of one color and 6 tokens of another one. **The game:** 1: Whoever plays first and the color of the tokens of each player is drawn. 2: The second chooses a token from his opponent so that he places it on the board, covering four squares on the board. 3: Then the first player does the same by choosing a token from the other player so that he is the one who places it on the board. **Aim of the game:** when a player cannot place the token in his turn he loses the game.



INTERACTIONS

27 – TIC TAC TOE (THREE-DIMENSIONAL TIC TAE TOE)

Three-dimensional tic tac toe. It is a game for 2 people which has a three-dimensional board and balls of two different colors, one for each player.

How do we play? It is played in turns, each player chooses a color and must place a ball in any of the holes of the three-dimensional platform. **What is the AIM?** we must align 4 balls of the same color. The line can be formed vertical, horizontal, diagonal, and can be in different heights.



28 – PYTHAGORAS

How can we verify that the famous theorem we were all taught in high school was true? The sum of the areas of the two squares on the legs equals the area of the square on the hypotenuse.

With an installation of acrylic and minispheres, mounted on the wall is explained in a very simple and strong visual impact; the Pythagorean Theorem. A right triangle and three squares attached to each of the sides are mounted on a rotating structure. When turning the set, the balls contained in the large square, go to the two smaller squares to fill them completely. The veracity and foundation of the theorem is verified in this graphic manner.



INTERACTIONS

29 – FRACTIONS

In this experience there is a cylinder of 2 m in diameter simulating a fraction made and portions of opaline acrylic pie with diffused interior light. In one of the walls there is a game that consists of a circle with 4 numbers, that circumference rotates to form a fraction whose result is already prefixed to its side, and when finding the result, it is illuminated in green. In another of its walls there are portions of corporeal pies and people must guess which numerical fraction corresponds.



30 – MAGNITUDES

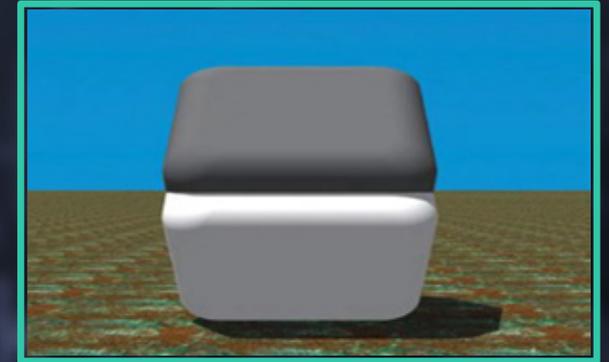
Magnitude is a property or measurable quality of objects, that is, to which different values can be assigned as a result of a measurement. Examples are the magnitudes to measure lengths, areas, volumes, masses, time. In this area there are giant prints of cubes that determine volumes of liquids and giant prints of thermometers that compare the different scales of Celsius degrees, Fahrenheit and Kelvin, made in acrylic glass and routed mdf with polyurethane lacquer finish. In another wall we find a scale of km, hm, dm and cm where each participant will regulate its height in each scale to see its comparison



INTERACTIONS

31 – COLORS THAT CHANGE

This illusion consists in seeing this image: two blocks, which are not the same color, or so it seems. You see one gray and the other white. But in reality they have the same colors and the way to see them correctly is to cover the division between the two. What happens is that our brain captures the wrong information. It is played with shadows and stripes of light, which is called "Cornsweet Effect", and is known as the Craik-Cornsweet illusion, which was explained by Tom Cornsweet, in the '60s.



32 – VELVET HANDS

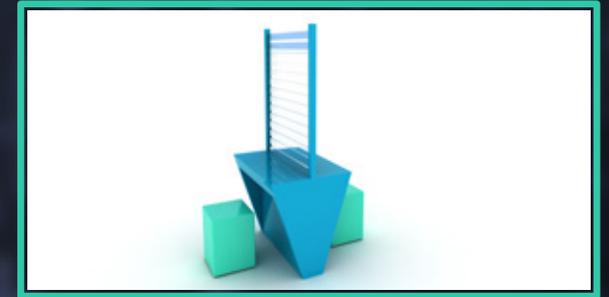
In this experience, the player must place each of the hands on one side of the net and join them so that they barely touch and move at the same time as caressing the net. What do you feel? Surely after a few seconds you had the feeling of having touched something similar to velvet, however you touched a nylon thread. That's weird! How different we feel about what is there! Test what happens if you change the speed of the movement.



INTERACTIONS

33 – FACE MIXER

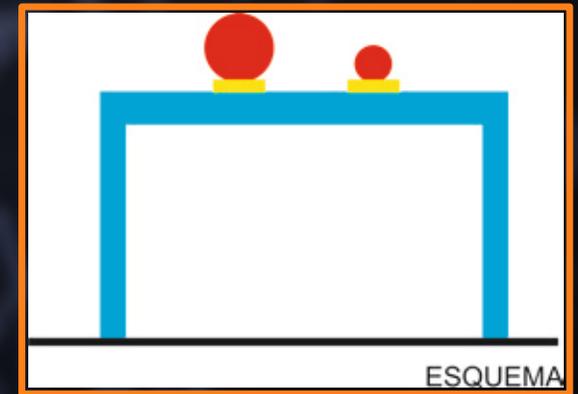
This experience is an optical illusion in which two people must sit down, one on each side of the table, facing each other. In the center of the table, there is a divider in vertical position, which contains strips of mirrors (on both sides) separated with a space (light) of the same height, alternating. (strip, space, strip, etc). When looking at the mirror strips the participants will see each other with their faces mixed.



34 – HOW MUCH DOES IT WEIGH?

First raise one ball and then the other, which one weighs more? You can check it using the scale. The two balls weigh the same! However, we perceive the small one heavier. The brain is not good at estimating the weight of objects since it takes into account other characteristics such as size.

Try to have both balls raised at the same time, one in each hand. You can also lift them using the handle.



INTERACTIONS

35 – HAND THAT DOES NOT RESPOND

The idea of this illusion consists in placing both hands on either side of the dividing mirror and whilst looking at the mirror the visitor gives an order to the opposite hand which does not comply.





It offers visitors big-size experiences to playfully interact with water, light, sounds, waves, strength, color and other elements that exalt the beauty of technology and nature.

ΦAUREA
EXHIBITIONS

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