Photomath 21

"Matematical Photography Constest"

Escuela Europea
de Alicante

SCHOLA EUROPAEA

The reflection

The reflection on the water is almost identically symmetrical to the landscape. The reflection is line symmetrical, no matter in what position you view it. Water isn’t a perfect mirror nor perfectly invisible. Part of the light rays from the landscape are reflected on the water surface, that’s why you can see most of what’s being reflected. A part of the light rays are reaching the bottom of the lake and that’s why you seem some of the bottom of the lake as well.

A Game Of Trajectory

In this photo, we can see that I'm throwing a piece of paper into a garbage bin. When we throw something in the air, there is a formula that we can use. However, we mostly use it in physics because it can help with more things in that domain. This act is called a trajectory, when you throw something in the air and hope it lands somewhere precise. To do this, we have to see at what speed the object is traveling, with how much force it was thrown with and where it was thrown. We also have to see if there is any wind for obvious reasons (the reason being is that if there is wind then it could change the trajectory of the object). From a mathematical viewpoint, basketball is also a game of trajectories.

<u>Earth globe</u>

This is an Earth globe I got as a present when I was a kid. This Earth globe also comes with a light in the inside, and it looks good at night.

The Earth looks like an oval shape but in this representation of the Earth it is a perfect round sphere. As we can see, the equator is represented with a thicker line going across the globe on 0,0 degrees North South. In geometry, the equator is the circumference of the Earth (C). In the middle of the sphere is located the centre (O), the axial tilt of the earth goes straight through that point. In this globe the axial tilt would also be the diameter (D) since it is a perfect sphere but, it isn't because it is an oval, that means that the distance between north and south is shorter than the distance between east and west. From the centre to the circumference there would be another imaginary line, the radius (R). Using this, we can calculate the circumference of the earth, $C = \pi \times D$.

Ronds de lumière

- Cette photo à été prise chez moi en simplement allumant la lumière. Avec cette photo, on peut démontrer que les maths se trouvent partout dans la vie de tous les jours. Sur cette photo, on peut voir trois cercles : un petit, un moyen et un grand. En trouvant le rayon ou le diamètre soit du grand, soit du petit, nous pouvons connaître celui de l'autre car le diamètre du petit est le rayon du grand et vice-versa. Donc si le rayon du petit est de 10cm, son diamètre est de 20 cm et donc le rayon du grand cercle est de 20cm et son diamètre est de 40cm. Quand au cercle moyen, il se trouve entre les deux cercles, donc vu que le grand est 2x le petit, le moyen est 1,5x plus grand que le petit. Nous pouvons donc en déduire que le rayon du moyen est de 15cm et que son diamètre est de 30cm. Grace à ces données, nous pouvons donc en déduire la circonférence de chaque cercle et donc la longueur totale de bandeau en plastique pour faire les cercles. soit environ 282,74cm.

CIRCLES OF LIGHT

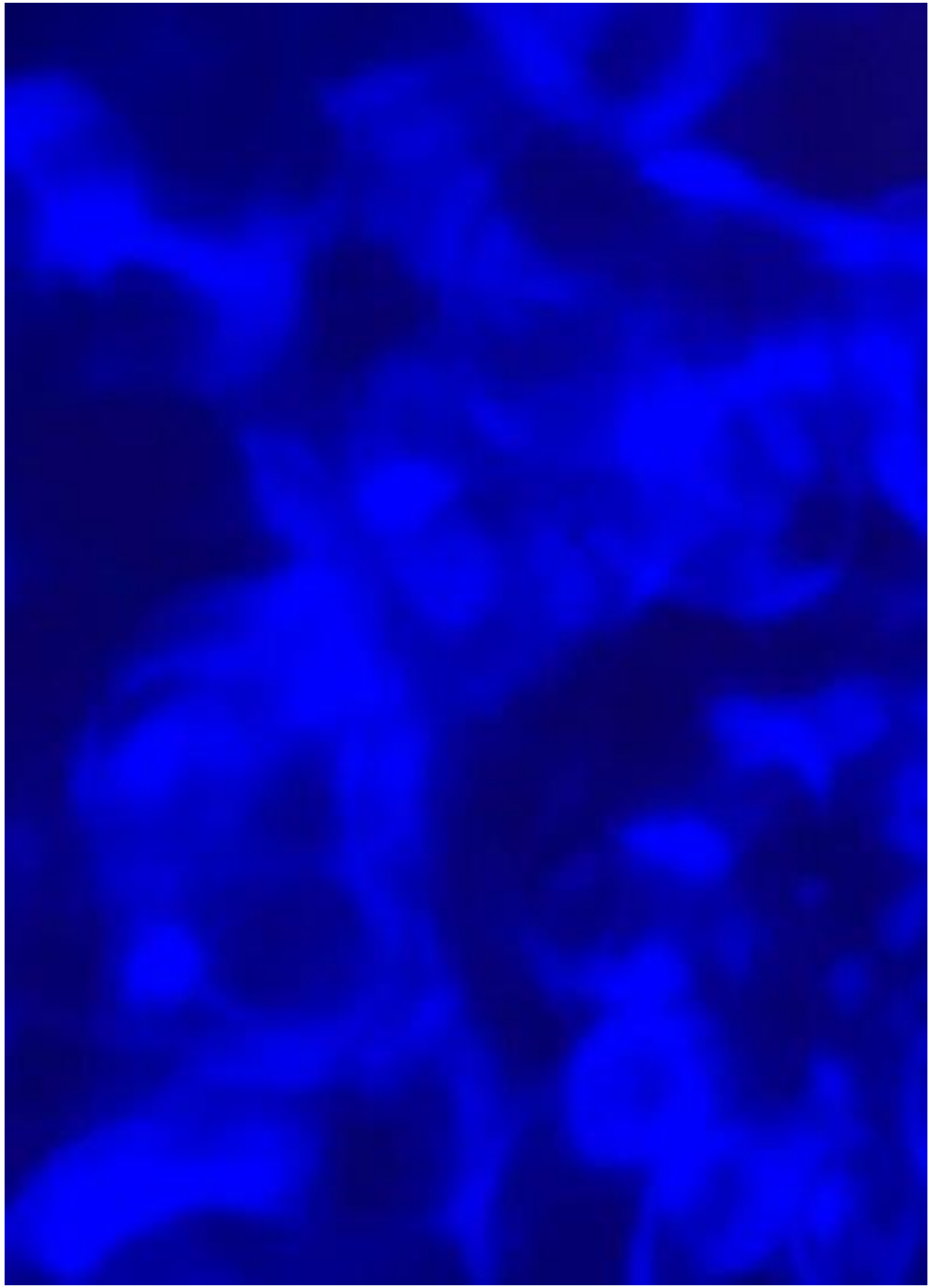
- This picture was taken at my house by simply turning the light on. With this picture, we can prove that math are everywhere in our daily life. On this picture we can see three circles : a small one, a medium one and a big one. By finding the radius or the diameter of the big one or the small one, we can find the radius/diameter of the other one as the diameter of the small circle is equivalent to the radius of the big circle and vice-versa. So, if the radius of the small circle is equivalent to 10cm, its diameter is 20cm and so the radius of the big circle is 20cm and its diameter is 40cm. Now onto the medium circle, as it is "medium" it is situated between the small and the big circle so the big circle is times 2 the small one, the medium one will be times 1,5. So then the radius of the medium one is 15cm and the diameter is 30cm. Using this data, we can now find the circumference of all three of the circles, and find the total length needed of LED strip for the whole lamp. So about 282,74cm.

Endless Corridor

This image shows two mirrors facing each other. They are reflecting the images in the opposite mirror. This represents exponential decay. The two variables would be the number of reflections (x-axis) and the size of the reflection (y-axis). As you increase the number of reflections, the size of the image decreases. If the mirrors were perfectly parallel and reflective this "corridor" would be infinite, however even with some of the best mirrors we would only be able to see a few hundred images since the light doesn't travel far enough for our eyes or cameras to capture. Theoretically in the graph the line should never cross the x-axis meaning the size of the image should never reach zero. The exponential decay can be calculated with the following formula: $y(t) = a \times e^{-kt}$ (*t*-> time, *y(t)*-> value at time, *a*-> value at start, *k*-> rate of decay).

Fibonacci Rose

The petals of this rose are in the Fibonacci sequence. The pattern is 1,1,2,3,5,8,13,21,34 and so on. The rule is that the two numbers add up to the next one and so on. Things like pinecones, flowers, and snail shells have that pattern; they are in the Fibonacci sequence. The Fibonacci sequence is in nature for efficiency. With the rule, you can fit more in a dense area. An example is the petals on a rose, which are crammed together to allow for more petals. They all grow according to the Fibonacci sequence; the last two numbers add up to the next. Each new petal grows in spaces between the previous set.

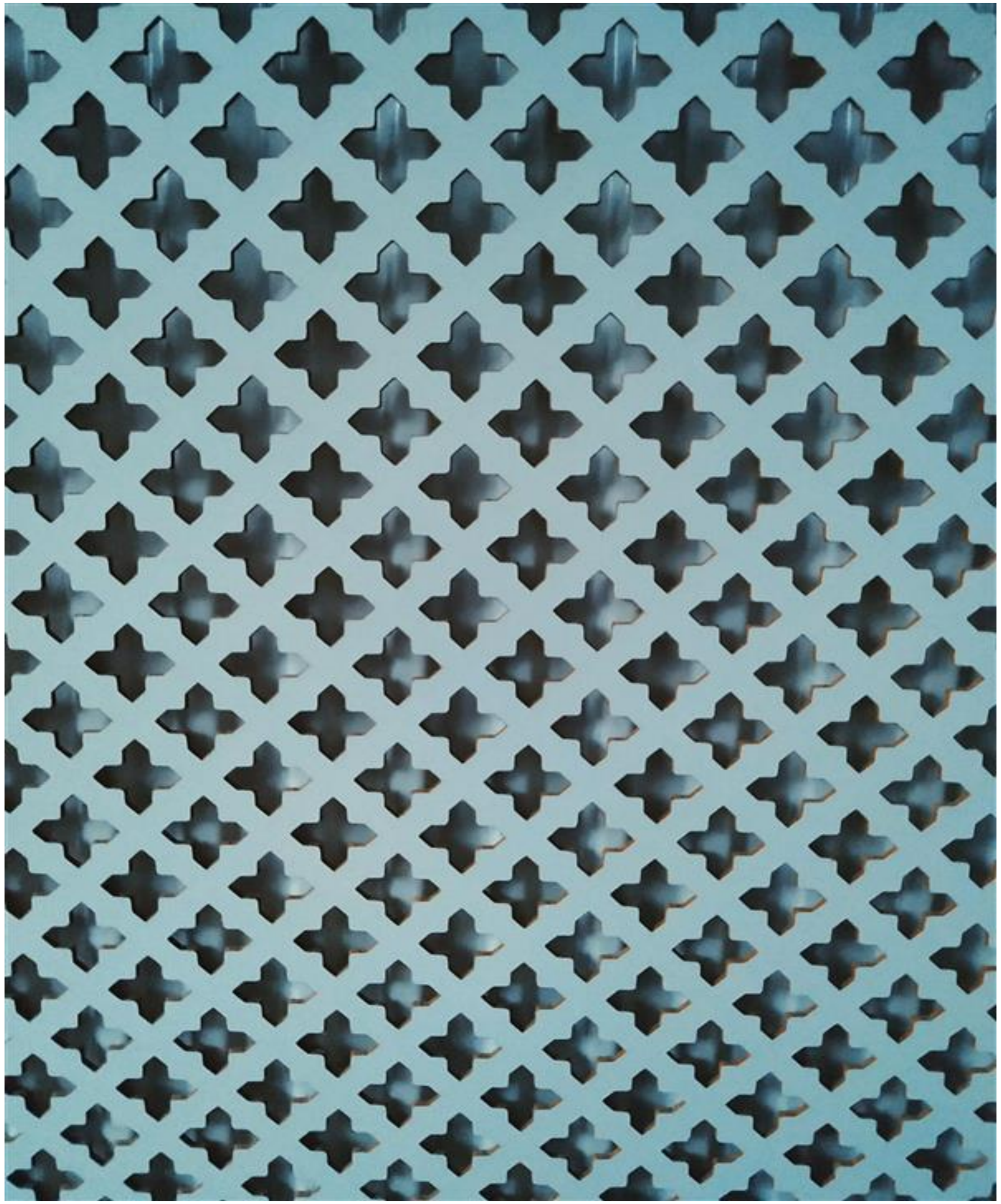


BLUE SMOKE ABSTRACT (SHAPES/GEOMETRY)

This is blue smoke, generated from a bush fire with blue dyed water resulting in making Blue smoke. In math, this picture shows the different symphony of shapes in geometry. Geometry is a huge part of our life even when we have no idea it's there, it helps us with measuring circumferences, area and volume or when you need to build something. For example: Funnels, cloths, food, sports etc...In my case you can see that even in smoke you can see the simple forms of geometry with several shapes such as Circles, Triangles, Squares etc...

Snowflakes

I was inspired by the winter weather and I took this picture on a window at my home. Snowflakes make me think of maths because even though they look messy on this picture, they are made up of very neat geometrical shapes. If you look closely, you can see long straight lines from which smaller parallel lines depart. You can also spot a few triangles which make me think of a bunch of other formulas… It took me some time to take the perfect picture, but the process was fun and interesting!



Symmetric Board

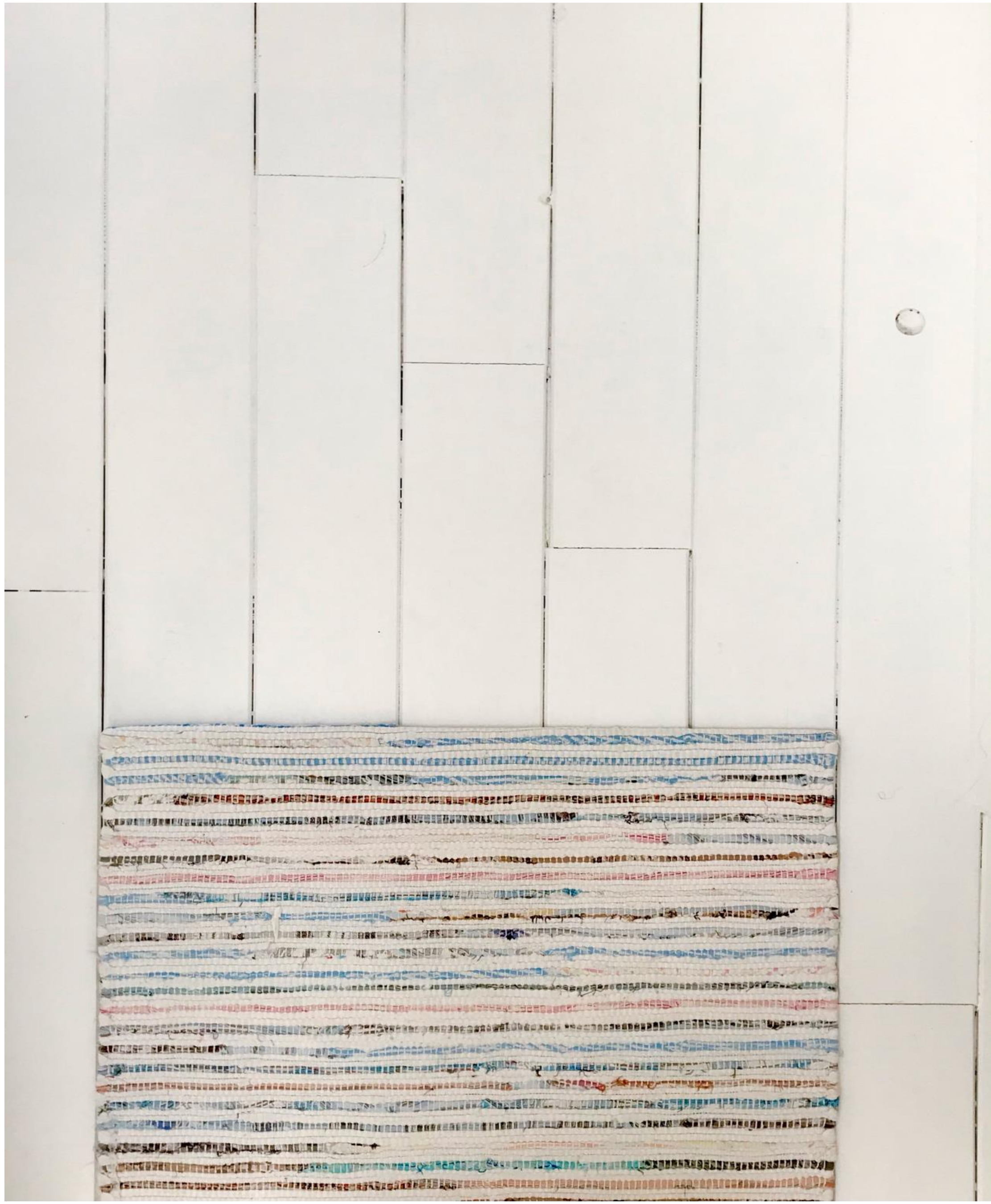
This is a wooden board used to cover a radiator. As you can see the design consists of one geometrical figure repeated various times with the same separation length between them, that is what makes it symmetrical. This is a clear example of how symmetry is in our lives and makes objects be nice to look at. This is just one example, but there are a ton of symmetric objects in everyone's house.

Seashell

When the assignment was first mentioned I automatically thought of Seashells since I saw them in the book, we studied a month or two ago (55 mathematical ideas) since it was listed in there. Newton's Shell theorem behind it is that seashells are all built around a center point of mass. It says that one, A spherically symmetric body affects outside objects gravitationally as though all its mass were concentrated at a point at its center and two, if the body is a spherically symmetric shell like a hollow ball no net gravitational force is exerted by the shell on any object inside, regardless of the object's location within the shell. Basically, things like gravity and the ratio between thickness and thinness can be ignored in comparison with unity. Simplified the symmetry of the seashell negates many forces on the outside concentrating them on the inside/center of mass.

Grains of rice on chessboard

Chess is a game well known for its strategy but also for the almost infinite probabilities of movement.
This photo represents the chess problem of Sissa, the inventor of chess. The legend tells that an Indian king asked Sissa what reward he wanted for inventing chess. Sissa replied that he wanted a grain of rice for the first square, two grains for the second, four for the third and so on for the 61 remaining squares of the chessboard. The king took him for an idiot but didn't understand how much grains it represented. He soon realized that Sissa had tricked him and that he was going to be ruined.
We can calculate that this is equal to $2^{64} - 1$; or 18 446 744 073 709 551 615 grains !!!
Jan Gullberg wrote: "with nearly 100 grains per cubic centimeter, the total grain volume would have represented about 200 cubic kilometer, the storing of which would have required 2,000 million wagons, or a train of length equal to a thousand times the circumference of the Earth. "



A floor

I took this picture of the floor in my hallway because it reminded my of maths in a few ways. Firstly, the wooden floor is made totally of parallel and perpendicular lines and form a sort of staircase figure with lines of exactly the same length. The carpet also aligns itself nearly perfectly in these lines. I also liked the fact that it also had lines perpendicular to the floor, which were also the only source of colour. And lastly, it reminded of maths because of the natural hole in the wood which formed the only circle in this otherwise very linear picture.

- **<u>Corresponding and alternate angles</u>**

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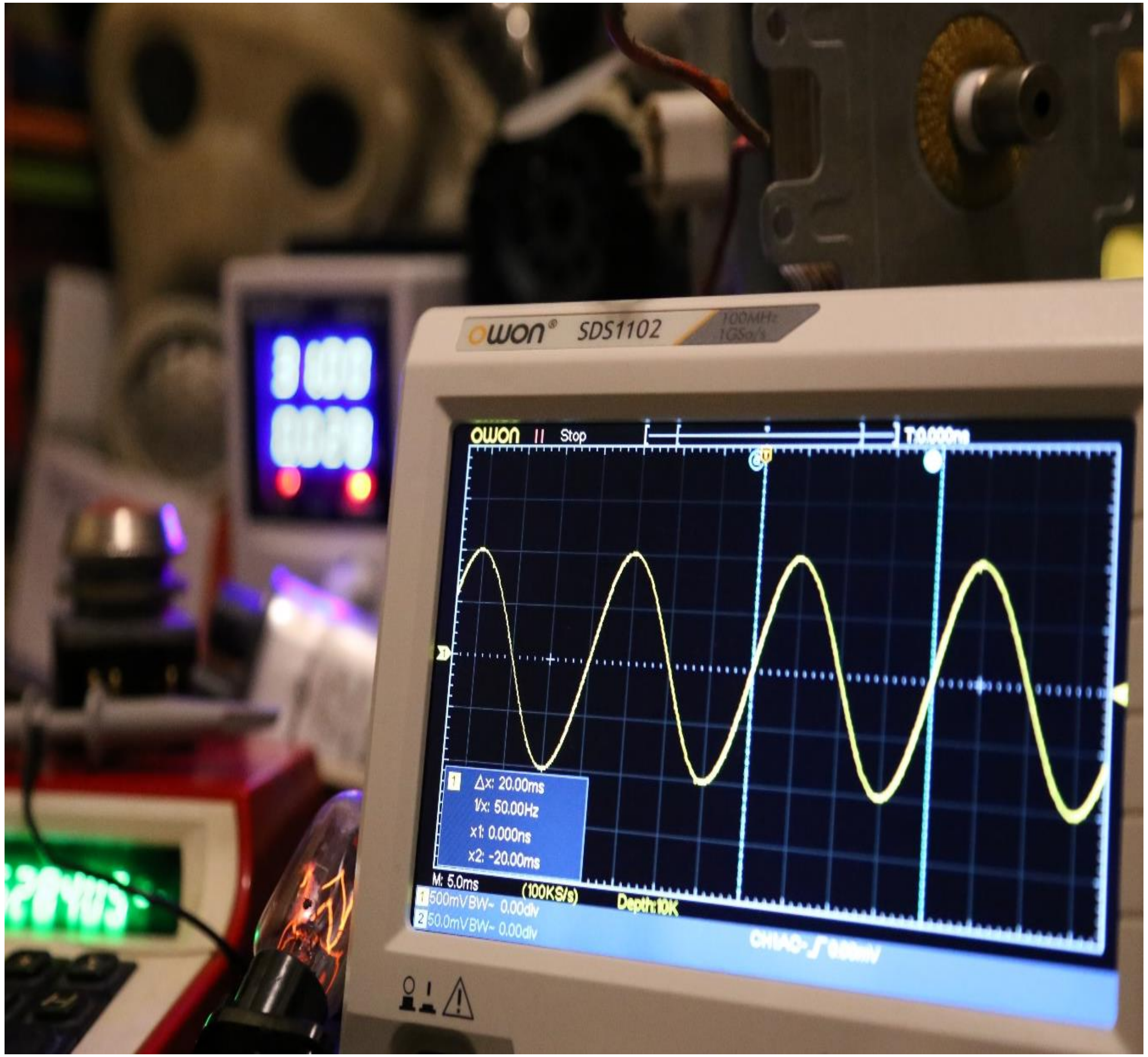
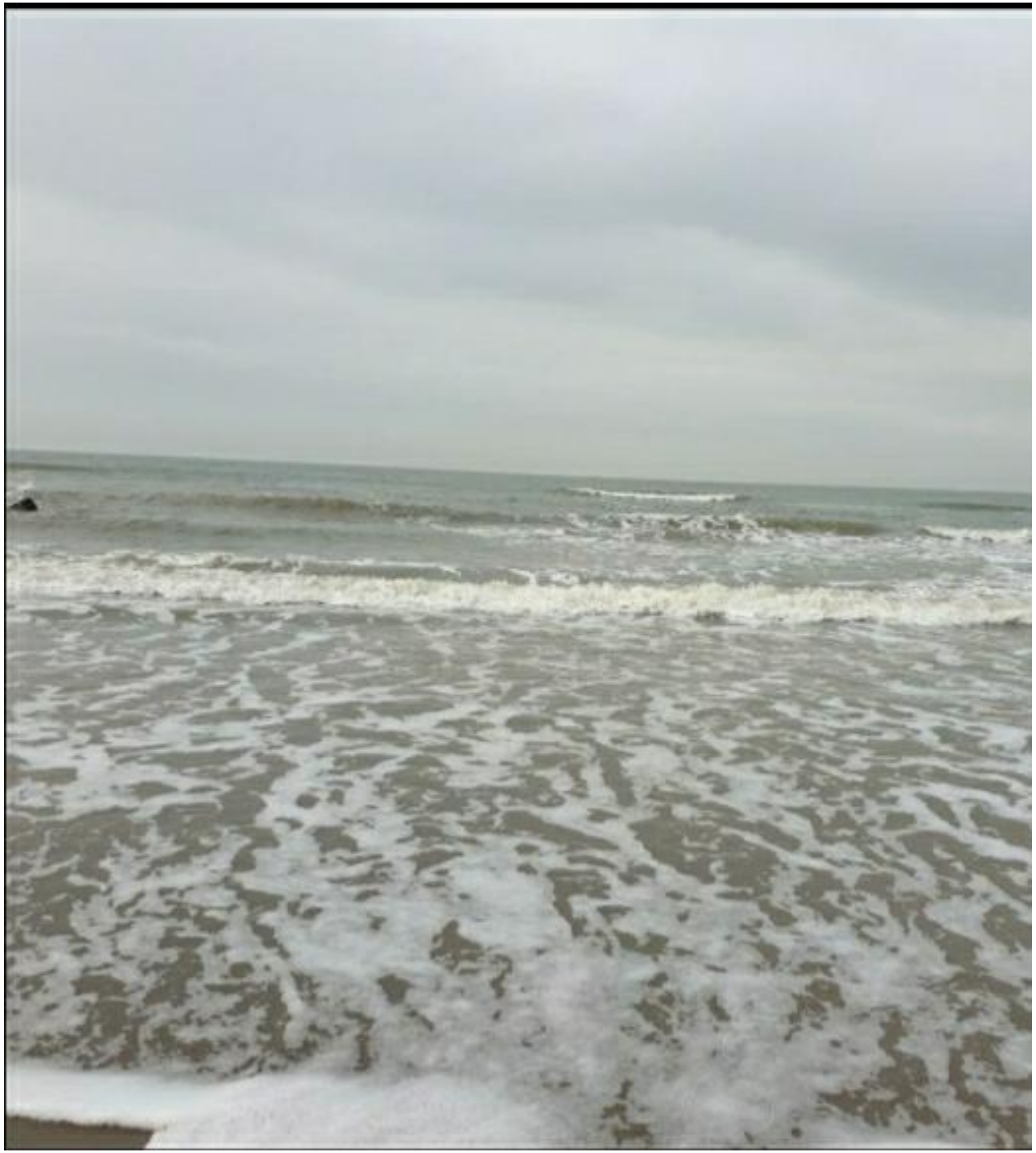
- In this picture, we can see a tree surrounded by snow that is being held by wooden sticks and black rubber bands. The rubber bands keep the fragile tree from falling, and they represent the alternate or corresponding angles because of the way they are positioned against the tree (like a Z).

A marble coffee table

This is a photo of a coffee table in my living room, I noticed that the legs are parallel to each other meaning they will never intersect. The bars that attach to the legs intersect and the angles are opposite to each other making them the same angle.



Here we can see a sinusoidal wave on my oscilloscope, every horizontal square or division represents 5 milliseconds, and every vertical division represents 0.5 volts with the horizontal line in the middle being 0 volts. Meaning the positive and negative peaks are both 1 volt in amplitude. A sine wave is called like that because the equation to graph it is $y = \sin x$. In order to prove this, we need to look at the cycle(one repetition of the wave) in between the blue lines where the line A is 0 degrees and line B is 360 degrees, now the x axis is in degrees. We can apply the equation if we want to find the voltage in the middle of the lines at 180° of the cycle: $\sin 180$=0, which checks out. And to find the voltage at 270° we can do $\sin 270$=-1 which is correct as well. If you where to look at the waveform of your power outlet you would see the same waves as in my picture. This is because the power grid supplies homes with alternating current where the current alternates between the positive cycle(electricity flows one way), and the negative cycle(electricity flows the other way).

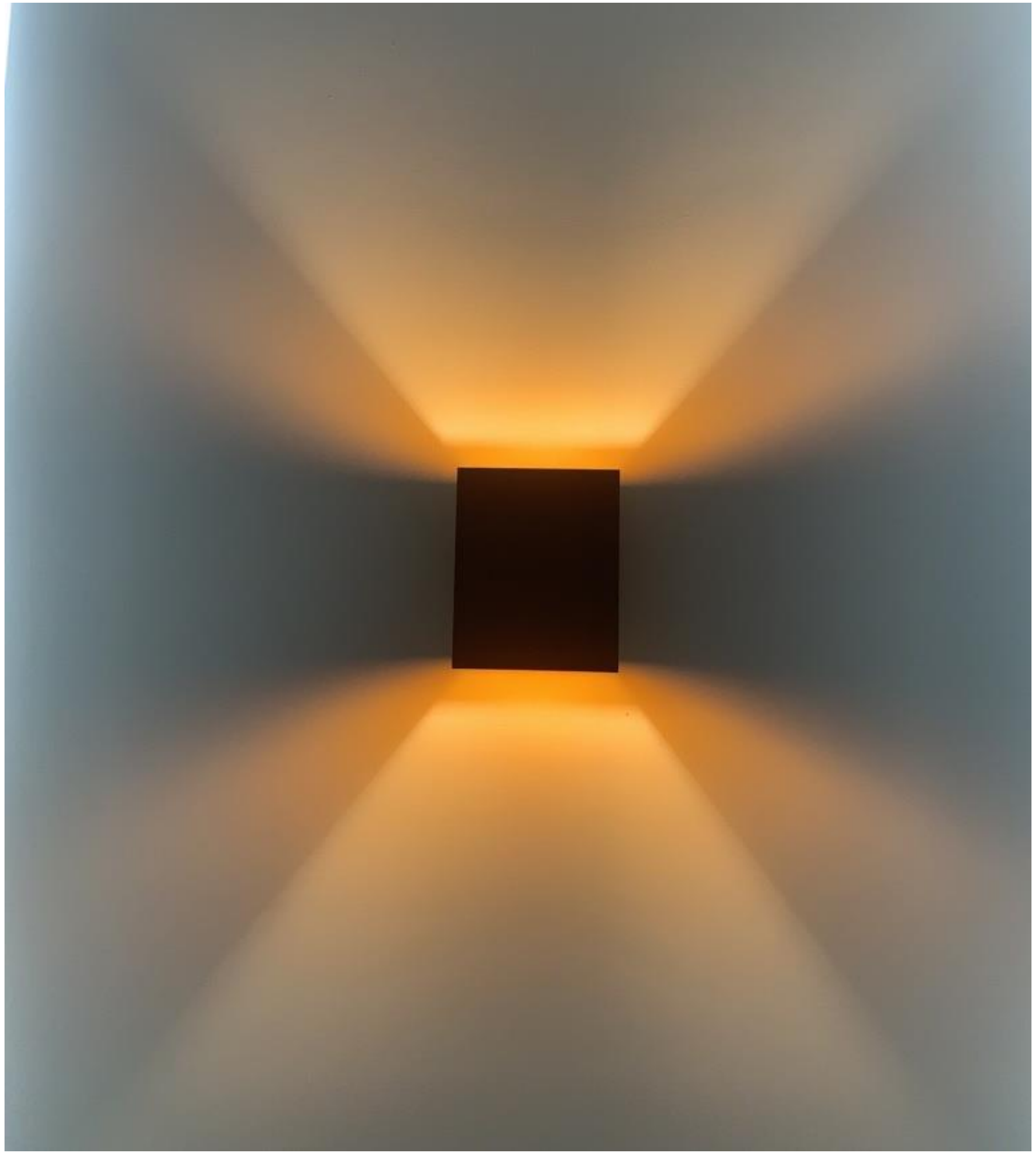


Waves of Mathematics

Les vagues représentent des fonctions. En mathématiques cette année, nous étudions beaucoup de chapitres sur les fonctions. J'ai donc voulu faire une photo en rapport avec ce thème. Notre école est dans une ville au bord de la mer, pour célébrer ceci, j'ai pris une photo des vagues de la Mer du Nord. De plus, comme les fonctions ont pleins de formes possibles, les vagues sont comme des fonctions sinusoïdales. L'idée est de représenter à la fois les mathématiques et mon école à La Haye.

Probability Tree

In maths this year we have studied probabilities. An easy way to understand probabilities is by making a probability tree. By starting on the root of the branch, the probability is 100 %. Then, when it splits in 2, so is the probability, either 50 % and 50%, or any other values. When the two branches split again, the probability becomes even smaller, and so on. This is a good way to determine combined probabilities.
What is the probability for a tree to touch the sky? … 0



X – Ray

Sur cette lampe qui reflète la lumière, on peut voir un X qui nous ramène à une inconnue.
La réflexion de la lumière reflète $|x|$ et - $|x|$
On imagine facilement le repère et la fonction valeur absolue.

Ballon hexagonal

Les hexagones dans la photo représentent une forme géométrique qui toutes ensemble forment une sphère.

Egmond

- **My photo was taken at the beach in Egmond aan zee on a sunny day and the sand was very neat and clean so it looked like triangles and this reminded me of Pythagoras theorem. The Trees have some interesting shapes and sizes this is like a tree diagram often used in Surveys and to show data**

Warsaw

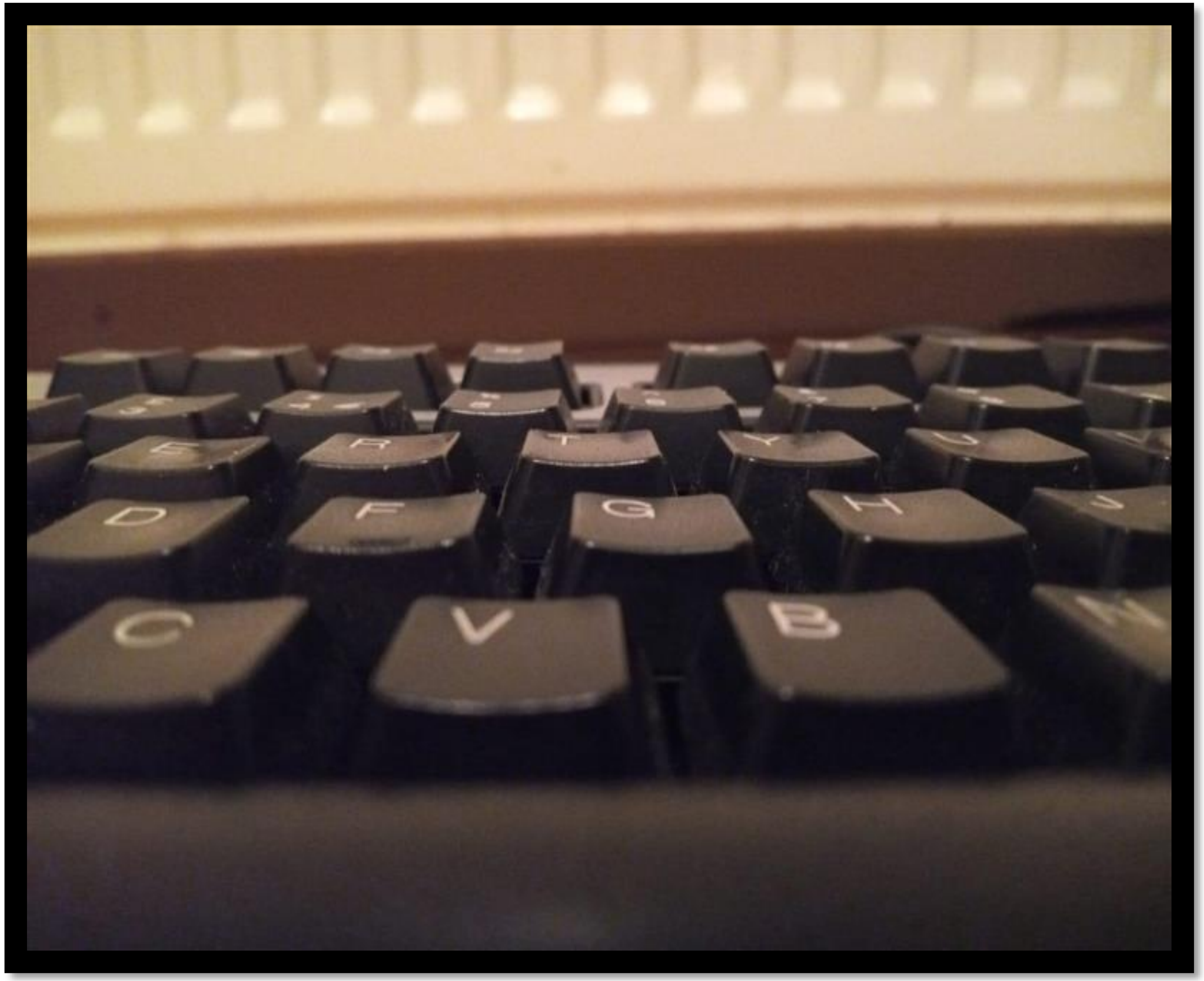
- This photo was taken in Warsaw, Poland, near my grandad's apartment. While I was on a walk I stumbled upon some old rails and thought it would be a great idea to take a photo. I know photos of rails aren't original at all, but I still thought in my photo there was a mysterious and even a haunted atmosphere, which I thought was quite unique. This is one of my best photos as I love how the rails aren't perfectly straight, and how there's a slight mist in the distance. This photo is math related due to its parallel lines in the center

Cylinder

- I took this photo when I was walking at the beach. I took this photo with the use of depth. This is one of my best photos because the seaweed on the front pole is detailed - with good contrast, the horizon is straight, and it has mathematical meaning. The mathematical meaning of this picture is geometry. The wooden poles are in the shape of a cylinder, each partly deformed due to aging material, sea waves' pressure and weather conditions. The poles are positioned in 90° angel towards the water surface.

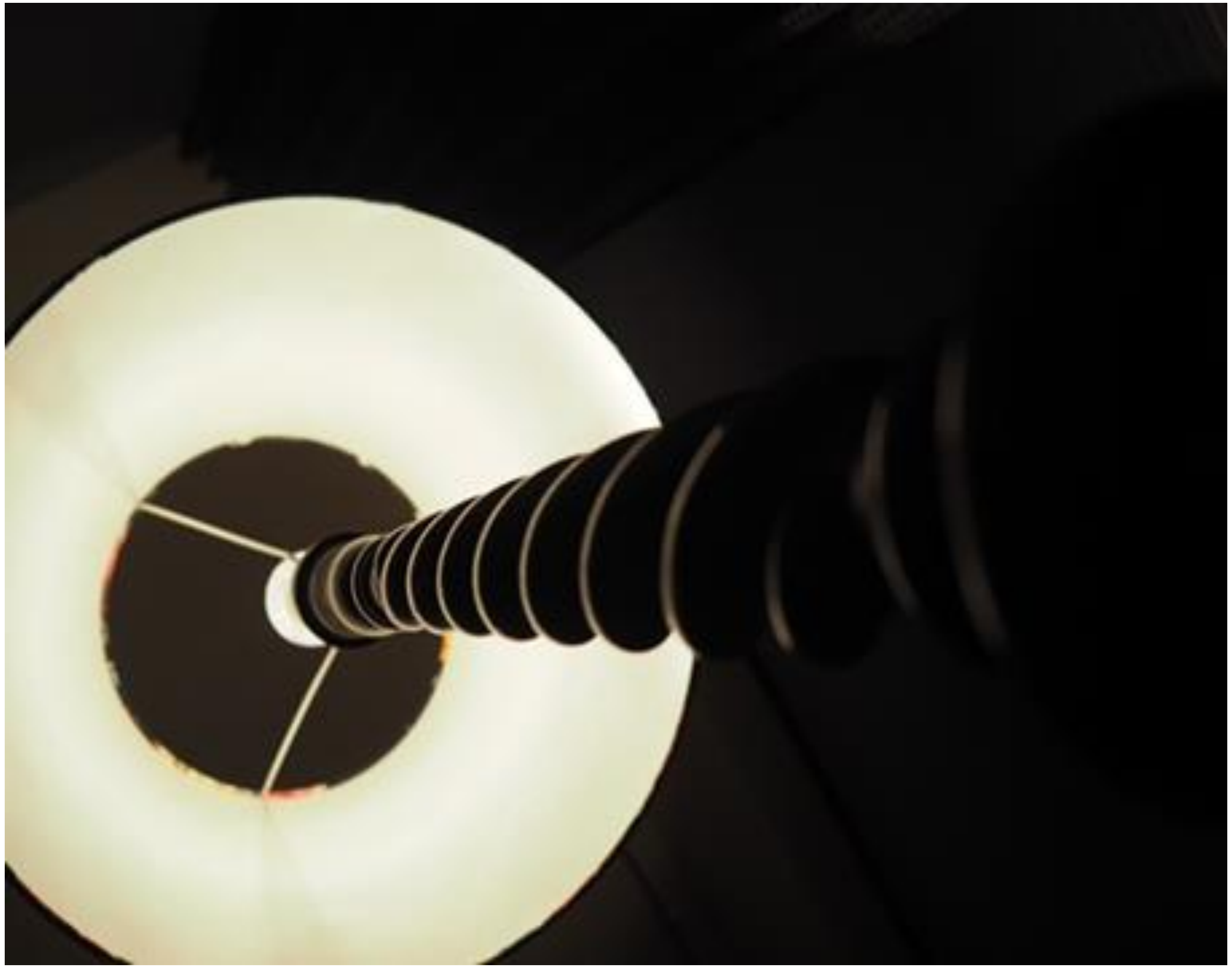
The Keys to our Future

Some people see a keyboard as something you use to type; however, it's much more than that. You can say it holds the keys to our future, as without it, many people in the world wouldn't be able to work or learn. Especially during these trifling times where even children are using keyboards. Keyboards are like bridges that are walked over many times in life. They are the passage of many of our emotions such as sadness and anger. For example, when you are writing an email to someone to express your condolences, or when you are apologizing to someone. So, everyone must be grateful that someone devoted their time to invent something so essential in life. I have taken the photo in this way to show how high keys on a keyboard should stand, because they serve us for life. I have also made the photo blurry with orange lighting to show how these keys have been standing for a long time and have supported us from time to time again. Thank you very much for taking your time to appreciate this.



The lampe

Description of your photo: this photo represents light and dark, the lamp is the light and the dark is the rest. Furthermore, the lamp has a spiral effect on its stem giving the mathematical feeling, it also matches with a part of the lamp cap, the lines supporting it. The angle of the photo was taken from the base of the lamp to the top, bit like a cave, suggesting that it’s all dark and the light is at the entrance this is similar with the lamp.



The skies

This photo was taken on my balcony it represents the different colors of the sky and the shapes of different houses.

Petten Aan Zee

- I took this photo on my smartphone, on my walk to the beach, located in Petten Aan Zee (Netherlands), in an early morning of February. In my opinion, what made this picture particularly unique was the rectangular pole standing out in the middle of the picture, adding more depth to the ocean view. To the right we can see that it creates a shadow, a silhouette, in fact forming a right triangle. This geometrical shape is definitely a factor that makes this image math related. In addition, the horizon of the water with the sky adds a touch of a mathematical purpose due to its continue straight line.

Cabinet

- This photo was taken by iPhone, in my house, in the living room. It is an antique cabinet of the early 19th century, in which we put our plates, cutlery, cooking books and other kitchen utensils. I really like how it turned out, there is a lot going on in this picture, with the depth, the repetition, and symmetry. With the glass on one side, it reflects the drawers of the other side, making it look like the cabinet is double sided. The repetition here, makes it feel like the cabinet goes on, and on, while it is, actually, not that long. There is also a lot of depth in this photo, for example, the lamp that you can see through the glass in the very back of the photo, and the garden with vegetation behind it. But also, the candle holder on the upper left corner, and the frame of a family picture, two objects that are disposed on top of the cabinet. The light is also very nice, and the sunbeams on the glass adds some geometrical forms, in addition to the wooden lines we already see, and the drawers.

The road

I took this walking home from my friend I took this photo because I love the way the road and field looks. I like the lines of the road's fields and lake. This is photo math for me because of the depth and parallel lines. Lastly I love the cool colours it is calming.

Rotterdam

I visited Rotterdam a few weeks before this assignment and the architecture in Rotterdam was beautiful it was very abstract and different from other cities. I thought this photo would be appropriate for the competition as these houses were cube houses and cubes and cuboids frequently appear in math problems.

Branches

- I took this picture on my phone by laying on the ground to have the perspective of an ant looking up at the sky. This picture was taken while I was on a walk in Heiloo, and I saw this lovely bush. I believe this picture is striking as there is sense of unknowing; what am I looking at? Why is the bush so nicely shaped? What size is the bush? There is so much scope for the imagination. I also think the colors are beautiful, like the way the dark green leaves contrast against the light blue sky. I feel this photo is mathematical by the way the little bundles of leaves are shaped and how the branches of the bush reach out from the stem. : I took this picture on my phone by laying on the ground to have the perspective of an ant looking up at the sky. This picture was taken while I was on a walk in Heiloo, and I saw this lovely bush. I believe this picture is striking as there is sense of unknowing; what am I looking at? Why is the bush so nicely shaped? What size is the bush? There is so much scope for the imagination. I also think the colors are beautiful, like the way the dark green leaves contrast against the light blue sky. I feel this photo is mathematical by the way the little bundles of leaves are shaped and how the branches of the bush reach out from the stem. : I took this picture on my phone by laying on the ground to have the perspective of an ant looking up at the sky. This picture was taken while I was on a walk in Heiloo, and I saw this lovely bush. I believe this picture is striking as there is sense of unknowing; what am I looking at? Why is the bush so nicely shaped? What size is the bush? There is so much scope for the imagination. I also think the colors are beautiful, like the way the dark green leaves contrast against the light blue sky. I feel this photo is mathematical by the way the little bundles of leaves are shaped and how the branches of the bush reach out from the stem.

Berlin

- This is a picture of a building in Berlin, I took the picture with my phone and pointed it at an upwards angle to give it a cooler effect rather than just taking the picture from a straight angle. I find this picture mathematical because of how the windows sort of meet in the center of the picture at the crease of the building and then flare out at an angle, and fence below the windows that goes straight across the picture, makes it look more interesting as there's a mix between upward angles and straight angles.

Stairs in a spiral shape

We can't really see the end of it

Hagen aan Zee 2

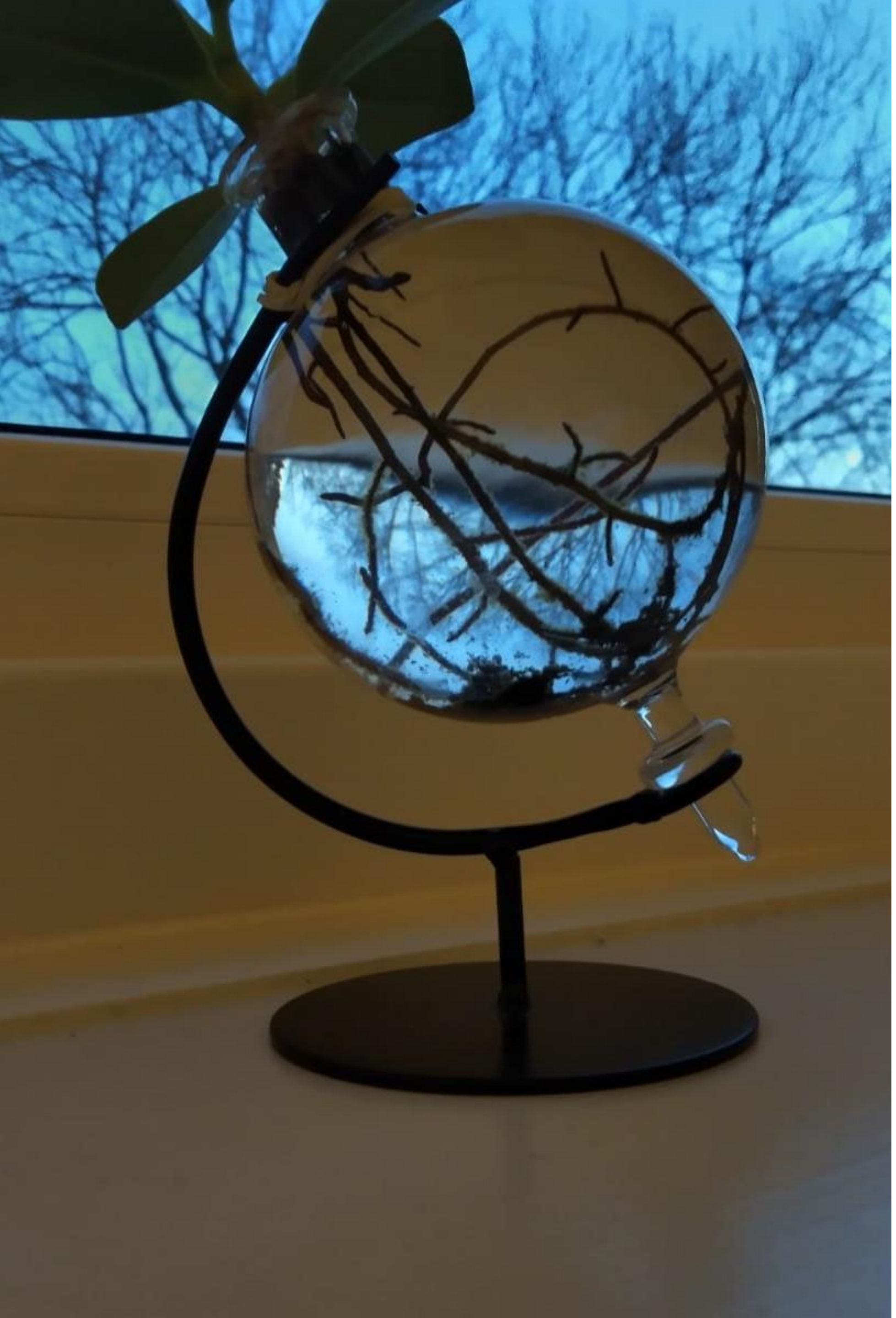
- I took this photo at Hargen aan Zee. The sand looked quite cool and I just knelt and took a photo and it turned out a lot cooler than I thought. I really like this picture because the sand looks like a desert and I like the depth on the photo and how it is focused on the sand. Although the photo is not very math related, I think it is linked a bit as it shows the thousands of shards of sand and the focusing and depth, as already mentioned, which can also be linked with maths.

Plants

This photo describes plants which are in a curvy line with different designs.

Bridge

This photo is of a suspension bridge known as Lakshman zhula. It is taken from India. The photo is taken a side view so that the lines look infinitive. We can also say that the lines are related to math. In addition, the light coming out from the bridge with the dark background gives a picture perfect look.



Reflecting

- When I saw my plant near the windows that was reflecting what was outside, I thought the reflection could be something about math. The symmetry with the axe as the end of the window and the reflection that is swiped over so the top of the tree goes to the bottom of the sphere which contain water and the roots of the plant. When one person looks at the picture, they first see the sphere, it attracts the eye and shows half the tree and half the window. This picture is made in my house by the window with the beginning of the night behind and in the water of the plant. This is the best picture I took because of the switch of what was outside, inside the sphere into something approximately equal in the sphere

Gran luxe

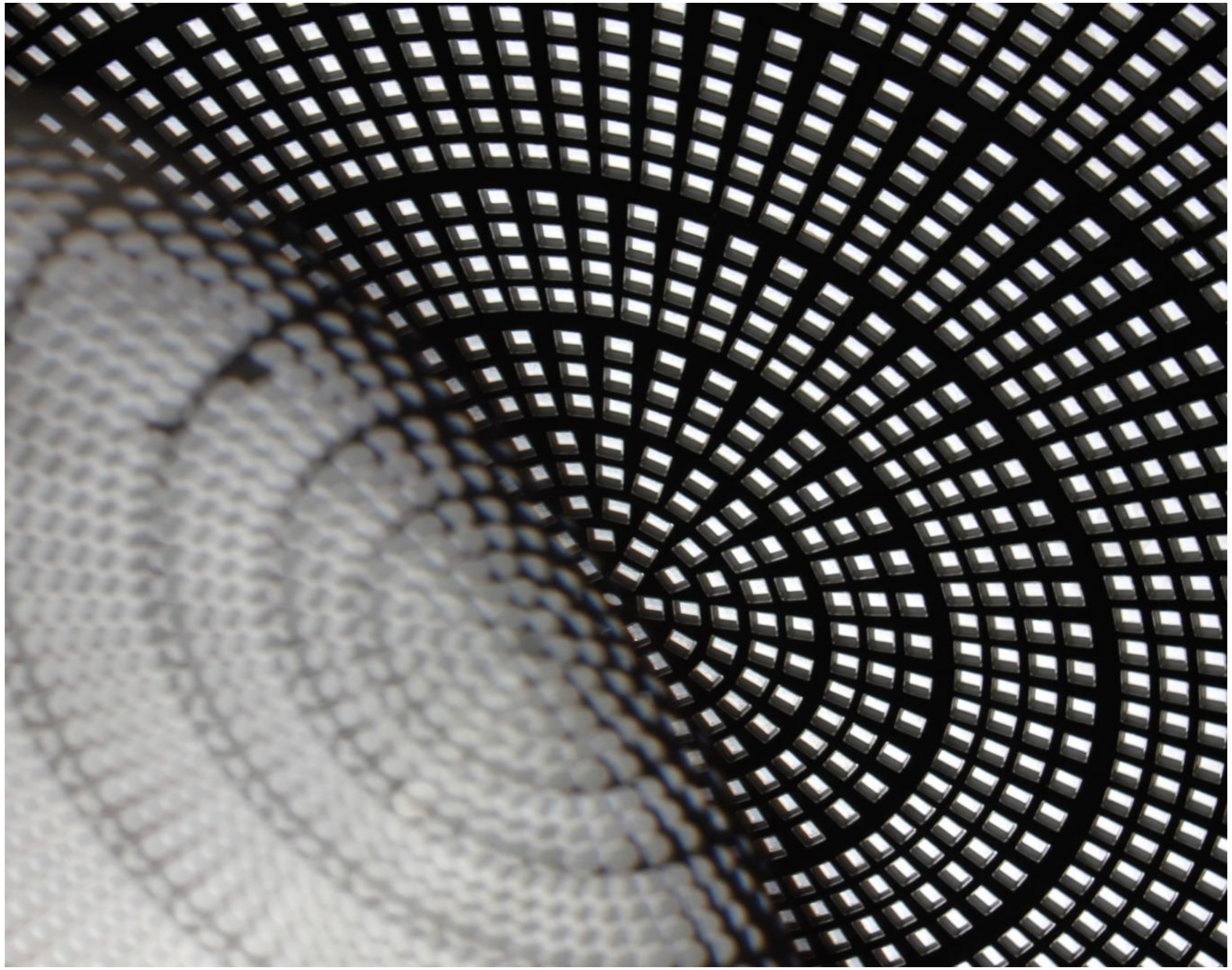
- **This image of a hotel illustrates it’s original hexagonal shape where every floor seems to be a direct translation of the floor below until the very top. The roof of the building contains clear symetry when cutting in half through the oval. Each side equal contains some interesting octoganal shaped windows surrounded by various geometrical shapes and illustrations.**

72

In this image we can see the biblical Tetragrammaton that makes up the proper name of God. A specific aspect of the Hebrew language is that each letter has a numerical value. This gematria representation creates a relation between the common value of יהוה that is 26 calculated with י = 10; ה = 5; ו = 6 and another important value in the Scriptures “72” calculated with 4x10 + 3x5 + 2x6 + 1x5. This triangle could be classified as a Jewish tetractys with the letters of the Tetragrammaton inscribed on the ten positions of the triangle. The fire around the triangle recalls the episode in the Book of Exodus when Yahweh presents himself to Moses and says: “I am who I am” from which derives the Tetragrammaton.

La coupole aux cubes

This concrete cupola inlayed with over 100 glass bricks set in concentric circles is fascinating. And the incredible thing is that without Maths, it couldn't exist. Because architecture IS Maths. From getting the heavy stones, concrete, and glass to stay balanced on their perpendicular to the ground structure, to creating intricate yet mesmerizingly beautiful geometrical designs that immediately capture the eye, it's all Maths. Moreover, depending on the point of view from which you look at this dome, it appears differently. From the angle I took, we see it is inlayed with <u>bricks</u> of glass. But if you look at the cupola from right underneath its square-shaped center, it seems there are only squares of glass. When I took the picture, I was trying to capture this in a different perspective from the one you have if you just stumble across the dome on your way to work. I tried everything: from capturing its reflection on a mirror or the eye of a friend. Then I noticed my glasses could give it a nice optical effect: through them, the dome looked different, blurred, dreamlike, as if you were looking at it through the waters of a magical lake.



The world of architecture and geometry

Architects intentionally or accidentally use mathematical laws when shaping buildings inside and out, striving for the order and beauty of the shapes of buildings in nature as well as the shapes in the construction itself. Mathematics and geometry are the language of architecture. I took the opportunity to capture this this building that is gradually being demolished, but despite all that I managed to capture something astonishing. Looking at the building we see that everything is related to mathematics. Mathematics is very important in creating useful space and buildings. An important part of architecture is the external appearance, beauty which is also achieved by mathematics. We can identify that this old house and building that is being demolished with having their own unique shape and structure. From both pictures it is visible that rectangles are common in all types of structures and shape. All buildings no matter their size have a geometrical structure. The most common building shapes are rectangular, L shaped, U shaped, T shaped, cross shaped, H shaped and cut shaped. Looking at the pictures it is noticeable that the most geometrical shapes that are visible in the images are rectangular, square and triangle shapes. A = L * W where A is the area, L is the length, W is the width, and a square is a rectangle with 4 equal sides. Wherever we turn around and look around in this world, we can see that math and shapes are all around us and that without out it nothing would be possible. With no background of basic understanding of mathematics it would be virtually impossible to live in a solid, stable, durable space.

Terrace

This is a photo of my terrace during the first snowfall in 2021 in Brussels. It was very beautiful outside and the sunlight, created shadows on the snow and it made a little magical effect. The whole photo has only geometric shapes.

Spiral Lamp

- This lamp on the wall adopts an axial symmetry. It is composed of a circle within a circle which contains what might be called a double spiral. This, like the Yin-Yang, is a famous representation involving the golden ratio and which can be explained by the Fermat spiral, a particular case of parabolic spirals.

Decagram

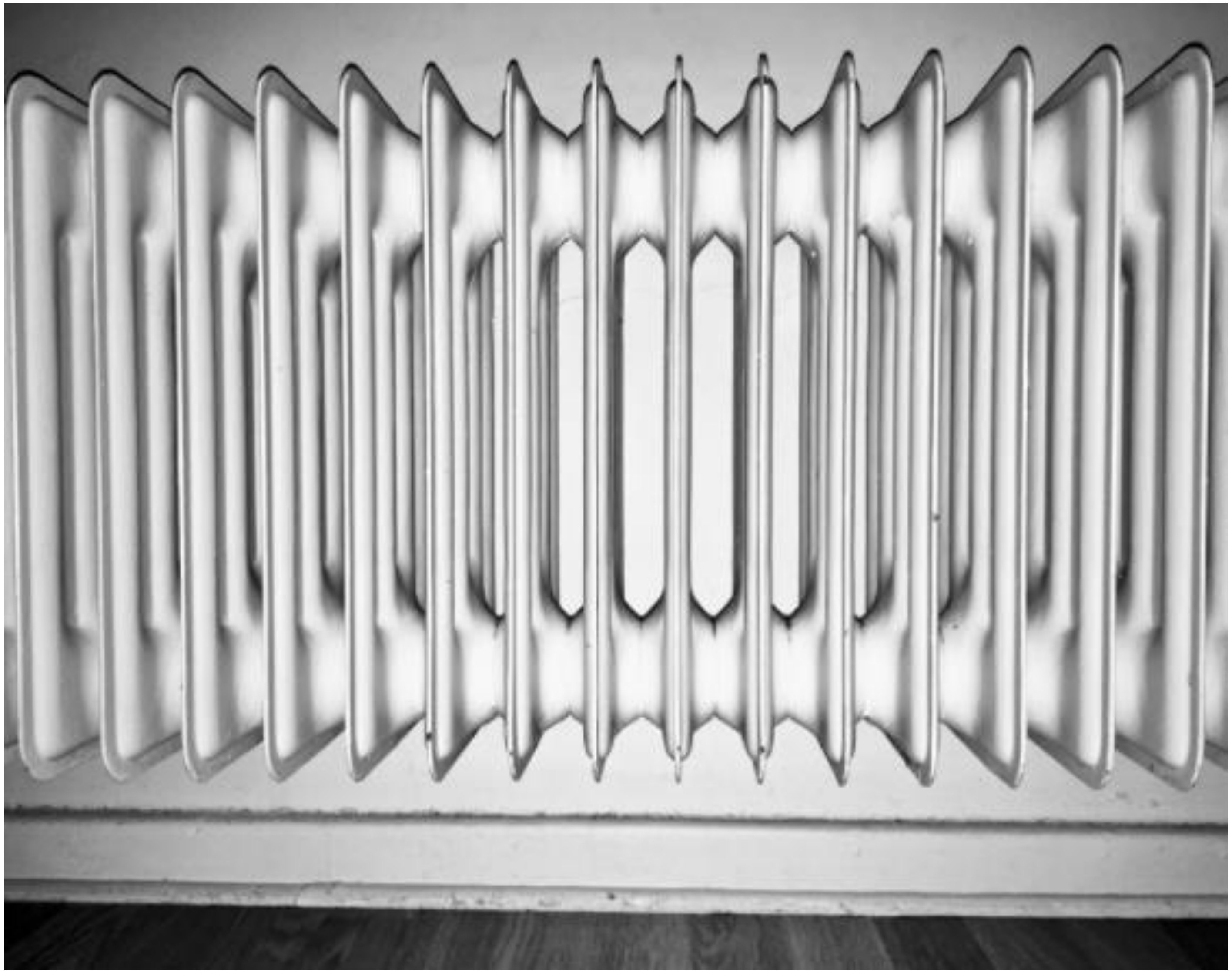
This photo taken above a glass actually represents a decagram, that is to say the star inscribed in a regular decagon which have isogonal and isotoxal properties. This highly symmetrical shape can give the effect of a spiral going towards the central circle of the photo but can also be seen separately as several petals of a flower. The incredible aspect of this shape is that it is composed of a regular pentagon on which is superimposed a second at an angle of 36°. These pentagons, from the initial decagon, are themselves linked to the golden ratio since each of their 5 diagonals are φ (phi) times larger than their sides. This allows, using what is called the golden triangle and the golden gnomon, to produce the Penrose tiling, a tiling that never repeats.

Reflections

A photo taken in Brussels city. This photo shows a very commonly used method of public transport, the tram. The tram consists of all sorts of mathematical shapes. The part that connects both carriages is made of several parallel lines, lines are very important in geometry. They are usually represented with a point A to a point B, just like the tram which brings you from point A to point B. The window is a rectangle shape, the area for a rectangle being, $A = l \times b$. Circles are also visible on the tram. The reflection of a famous Belgian monument, the Atomium can be seen on the rectangular shaped window on the tram. The Atomium itself consists of 9 spheres with lines connecting them. We cannot see all of the spheres on the window, yet thanks to reflections, another mathematical concept, we are able to capture several elements of geometry and maths in one photo.

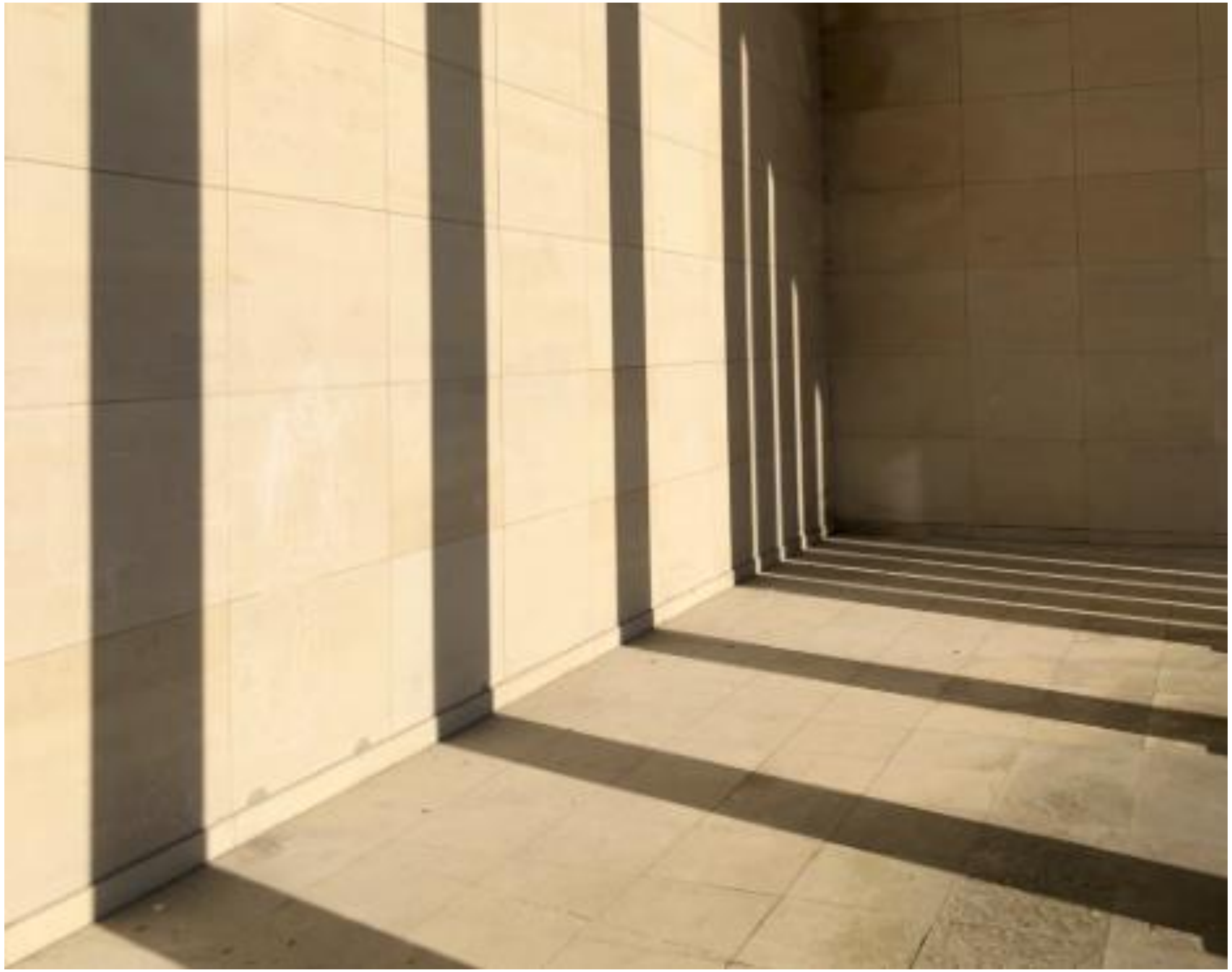
Emotion

Symmetry in everyday language refers to a sense of harmonious and beautiful proportion and balance. In mathematics, "symmetry" has a more precise definition, and is usually used to refer to an object that is invariant under some transformations; including translation, reflection, rotation or scaling. This radiator is therefore a perfect example of symmetry as the transformations named can be made. In the inside of the radiator we notice the presence of hexagons which 'fade' away as you move away from the center of the image.



Illusion

A column or pillar in architecture and structural engineering is a structural element that transmits, through compression, the weight of the structure above to other structural elements below. In this image, we see the shadows of these pillars and how they form a right angle.



Mysterious Ramp

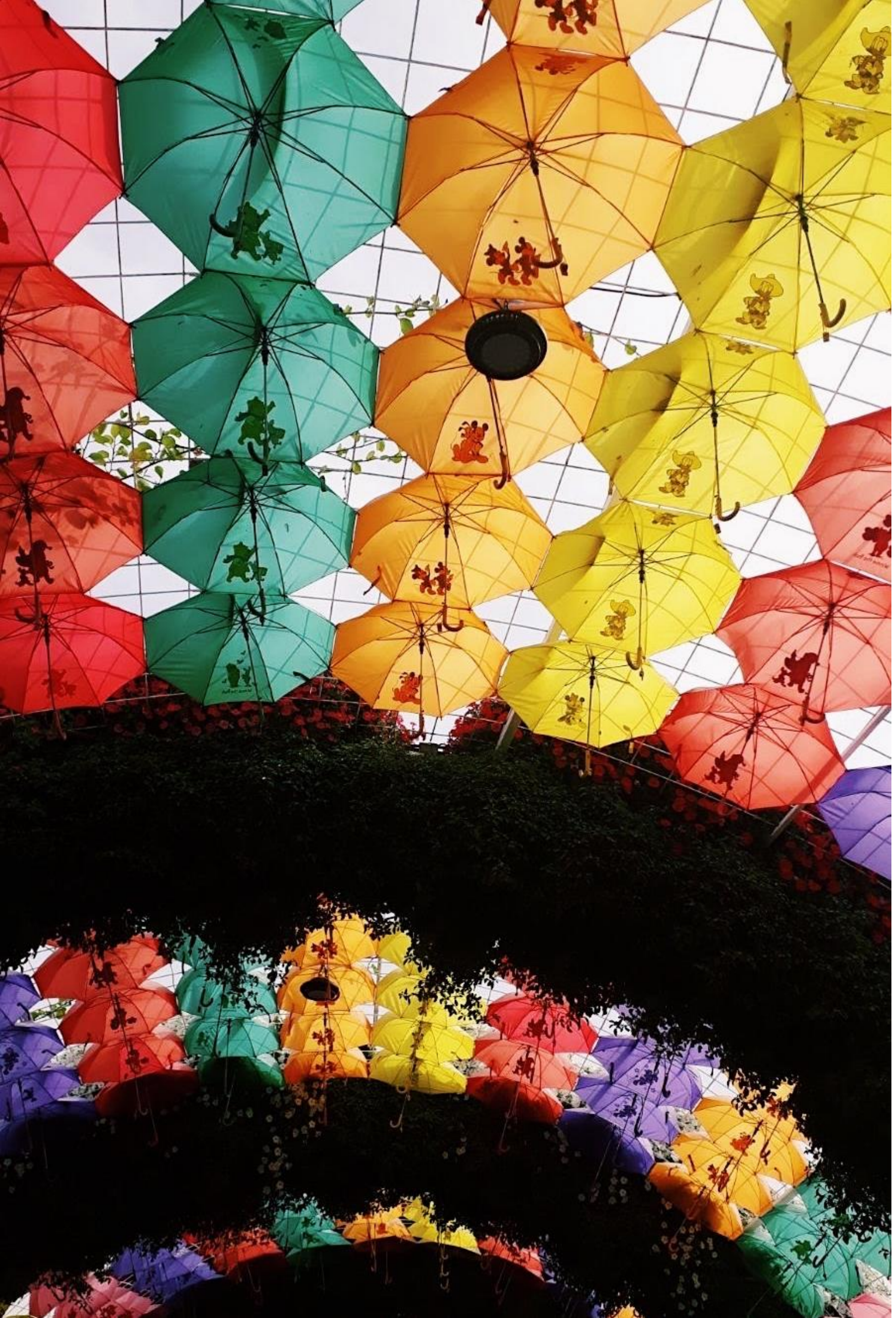
The stairs form differently sizes of triangles when you go from the right bottom corner to the left. From the shape of the ramp, you can find a slope and gradient. in addition, the reflection of the pillar in the back shows 2 parallel lines.

Reflections and shadow

A column or pillar in architecture and structural engineering is a structural element that transmits, through compression, the weight of the structure above to other structural elements below.The column is in the shadow and the reflection of the sun look like long rectangle shapes that deminishes in length as you go towards the right.

Twin

- Symmetry in everyday language refers to a sense of harmonious and beautiful proportion and balance. In mathematics, "symmetry" has a more precise definition, and is usually used to refer to an object that is invariant under some transformations. The lamp is therefore a perfect example of symmetry as if you do a line in the middle cutting the image in two, both sides would be identical.



Contrasts

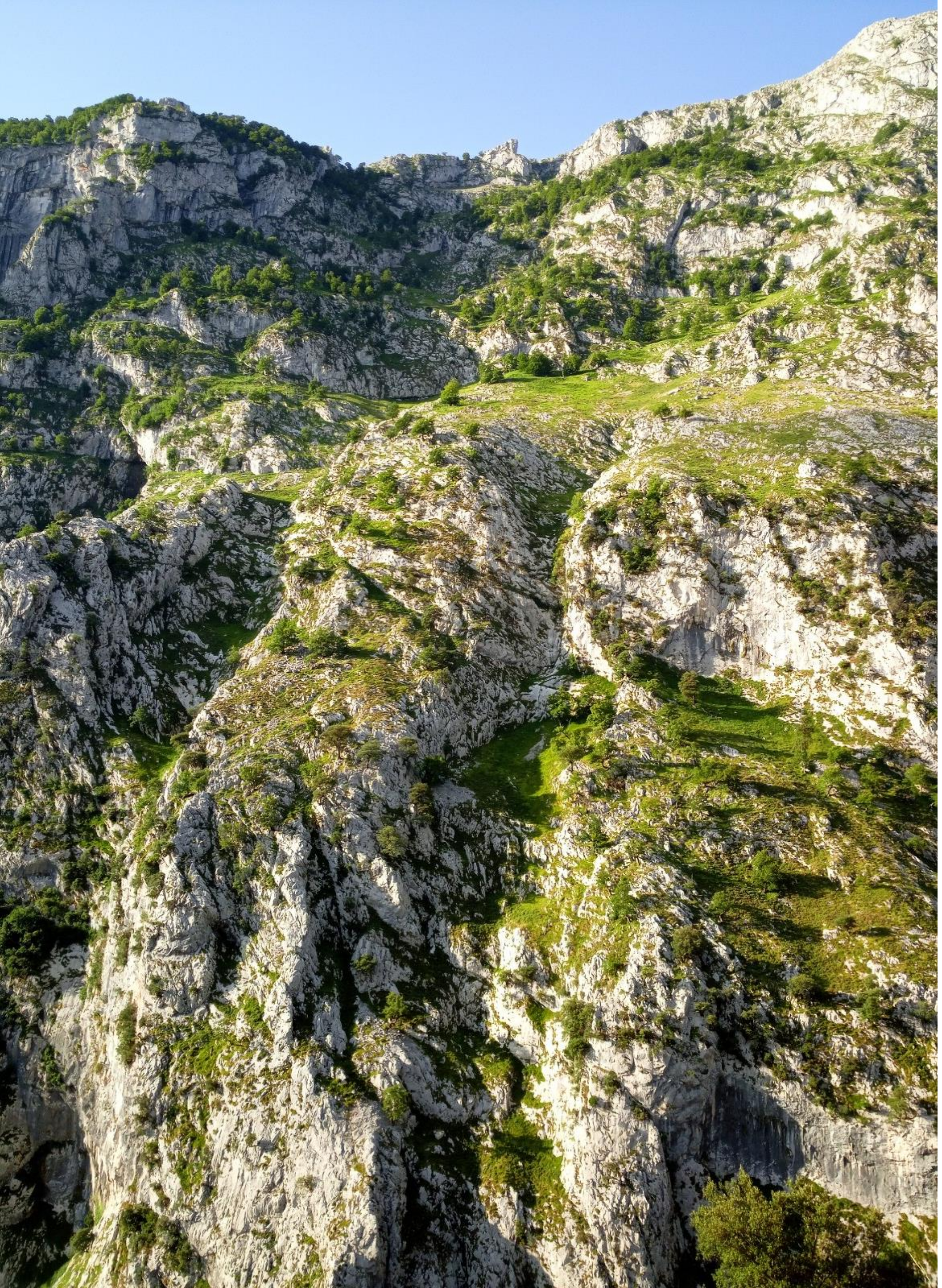
- This colourful umbrella roof shows us a variety of shapes. We see octagonal umbrellas and squares in between each umbrella. The accumulated leaves look like negative parabolas that are in a big contrast to the umbrellas considering the shapes and colours. There is a clear difference between dark and bright colours as well as angular and round shapes. We can also see an inverse linear relationship between object size and distance since both the umbrellas and the parabolas start appearing under smaller angles and therefore end up looking smaller with distance.

Amphitheatre

The mathematical theme in this image is the shape of these flowers they are perfect circles.

Pinnacle

In this picture we can see the triangular shape of the mountains



Themound

This picture is rich of geometrical shapes

Diefenbachia

There is a widespread belief of an innate opposition between nature's organic make-up and technology's binary structure. The past has without a doubt proved a certain tension between the two as technology encroaches on the natural world. Yet modern technology finds much of its inspiration in the natural world. This close-up of a spotted dieffenbachia exhibits a com plex pinnate venation and translucent glands, reminiscent of neural networks in a number of ways. From biology to photosynthesis, plants are effectively the quintessential of visual mathematics.

Lines

The mathematical theme of this photograph is lines, but most importantly vectors. Lines exist in our everyday lives, in fact, we are so surrounded by them that we do not notice all of them. The picture captures the intersection of two airplane trails. It is not by accident that they passed that certain point, point P, at different times, and perhaps at different altitudes. This was done with purpose, using vectors. A vector is a quantity that has both magnitude and direction. In the case of planes, the magnitude is the speed with which the airplane is travelling. To avoid collisions, vectors are used to calculate when each aircraft will be passing point P, making sure that the times are different enough so as not to cause disturbance to anything.

Architektonische Parabel

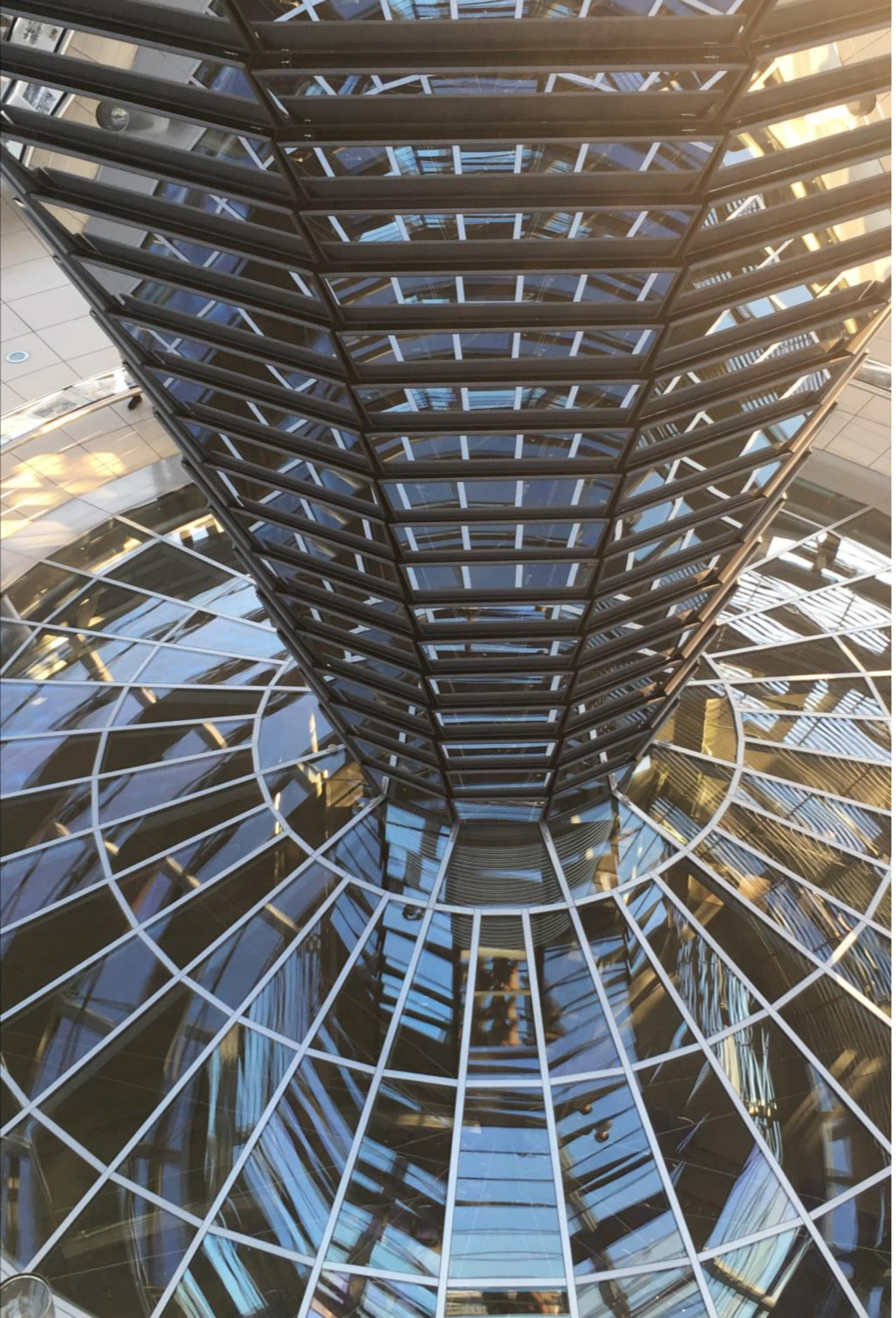
Auch wenn es keine richtige Parabel ist, sieht es so aus wenn man sich das Dach von unten ansieht

Caracola Aurea

- **En esta imagen se puede observar la presencia de la proporción aurea en la caracola del fósil de un Ammonite.**

Cubo imprimido 3d

Un cubo imprimido 3d con círculos de 360 grados en cada lado del cubo.



Cúpula del Reichstag

- **La estructura interior de la cúpula del Reichstag es un cono invertido sobre una base circular. Tanto en la base como en el cono, podemos observar un teselado formado por trapecios isósceles.**

El rey

- **Ampliando el foco en la mirada del pez (el rey), se destacan las varias formas circulares que forman la composición del ojo.**

Escalera en espiral

- **En el Louvre de París nos encontramos con una escalera con forma de espiral, al fondo de la imagen podemos observar la estructura triangular de una de las pirámides de cristal que cubren la entrada del museo.**

Escaleras

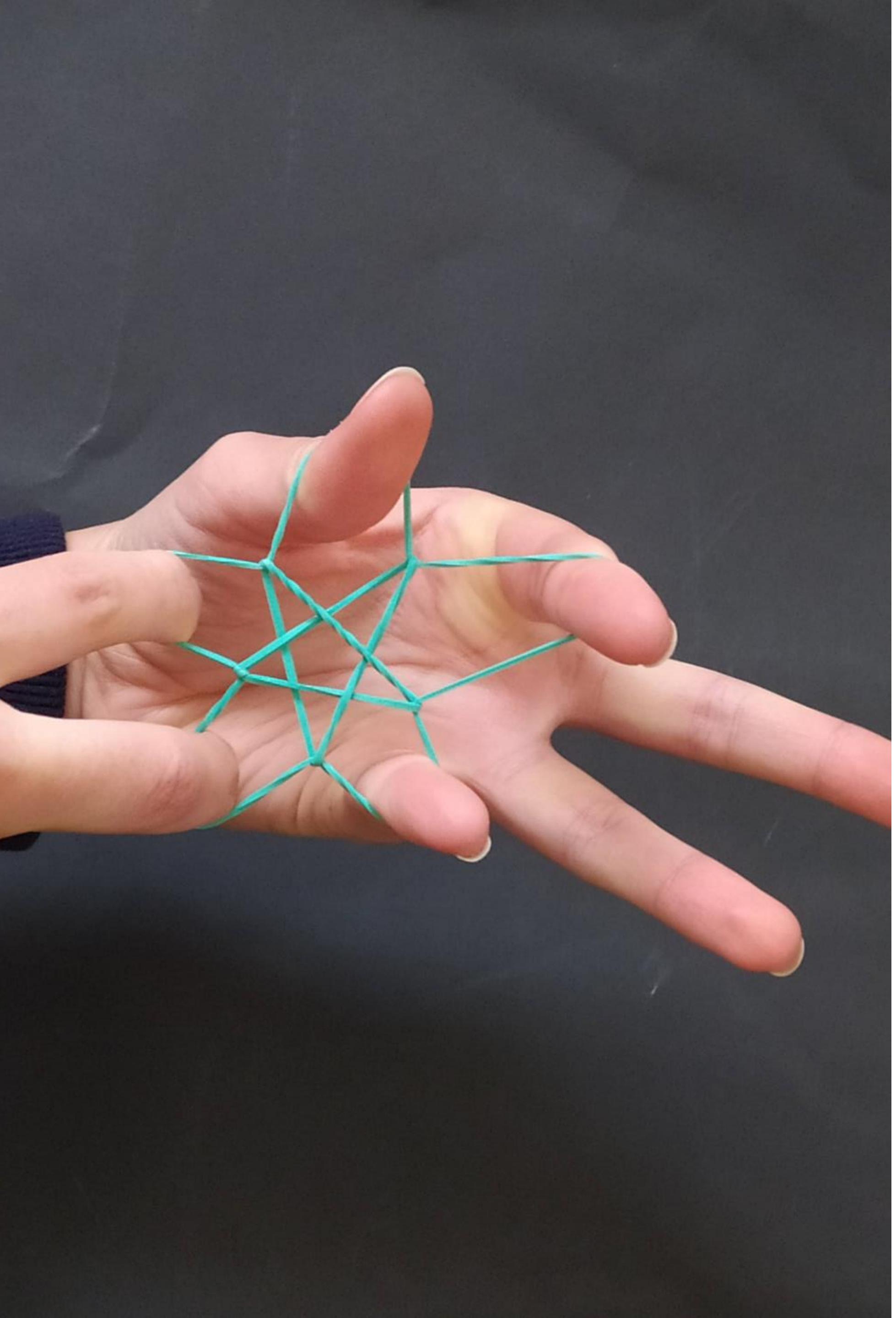
- **En esta foto se puede observar que entre dos barandillas de dos escaleras se crean ángulos, intersecciones, paralelas, diferentes tipos de triángulos...**

Estrellas en Granada

En la foto vemos una estrella de ocho puntas que ví en el techo de los palacios nazaríes en la Alhambra de Granada.

Geometría fractal en la naturaleza

- El brécol romanesco presenta geometría fractal (su estructura básica de repite a diferentes escalas) en su estructura. La cantidad de inflorescencias que lo componen es un número Fionacci (una sucesión infinita de números naturales).

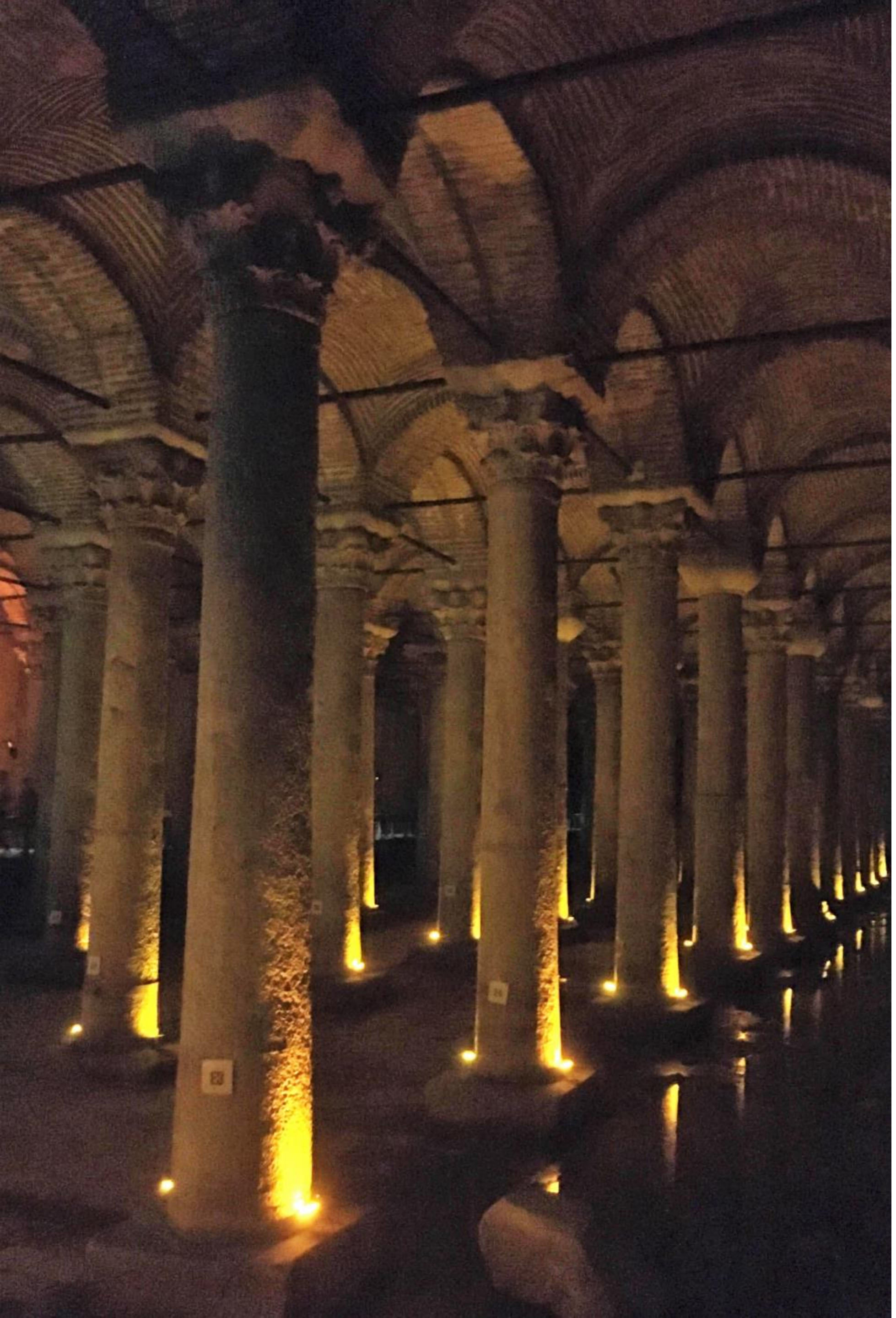


Géométrie élastique

- **Depuis tous petits dans nos jeux, elle était lá, bien visible a nos yeux. Elle naissait de nos main tel l'art baudelairien.**

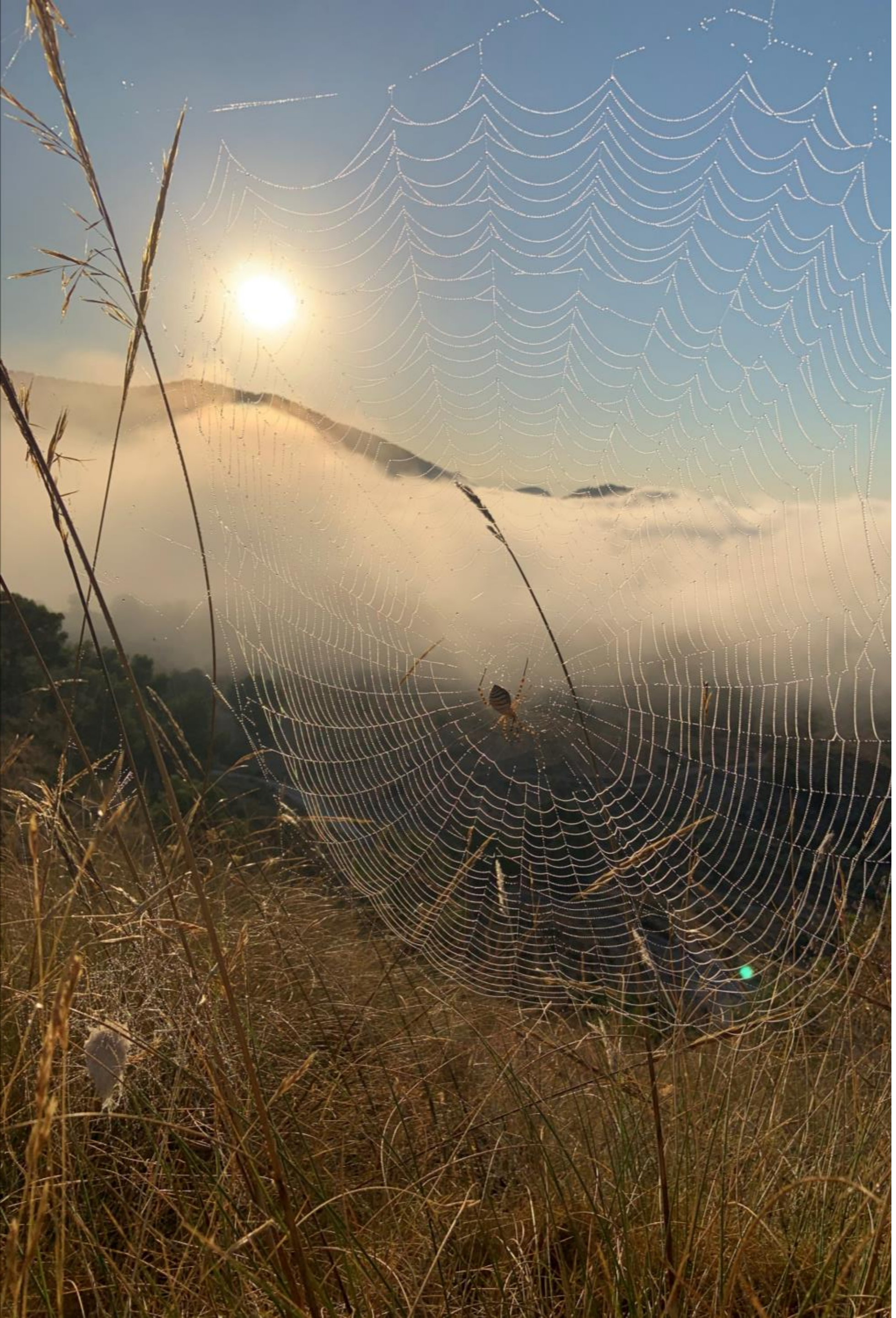
Ilusión cubos en relieve

- **La imagen muestra un suelo con cuadrados dibujados de tal manera, que crean una ilusión al ojo humano como si fueran cubos con relieve.**



Kavallerie Perspektive

- **Dieses Gebäude wurden von den Römer gebaut, und sie kannten gut die geometrie und dieses Perspektive**

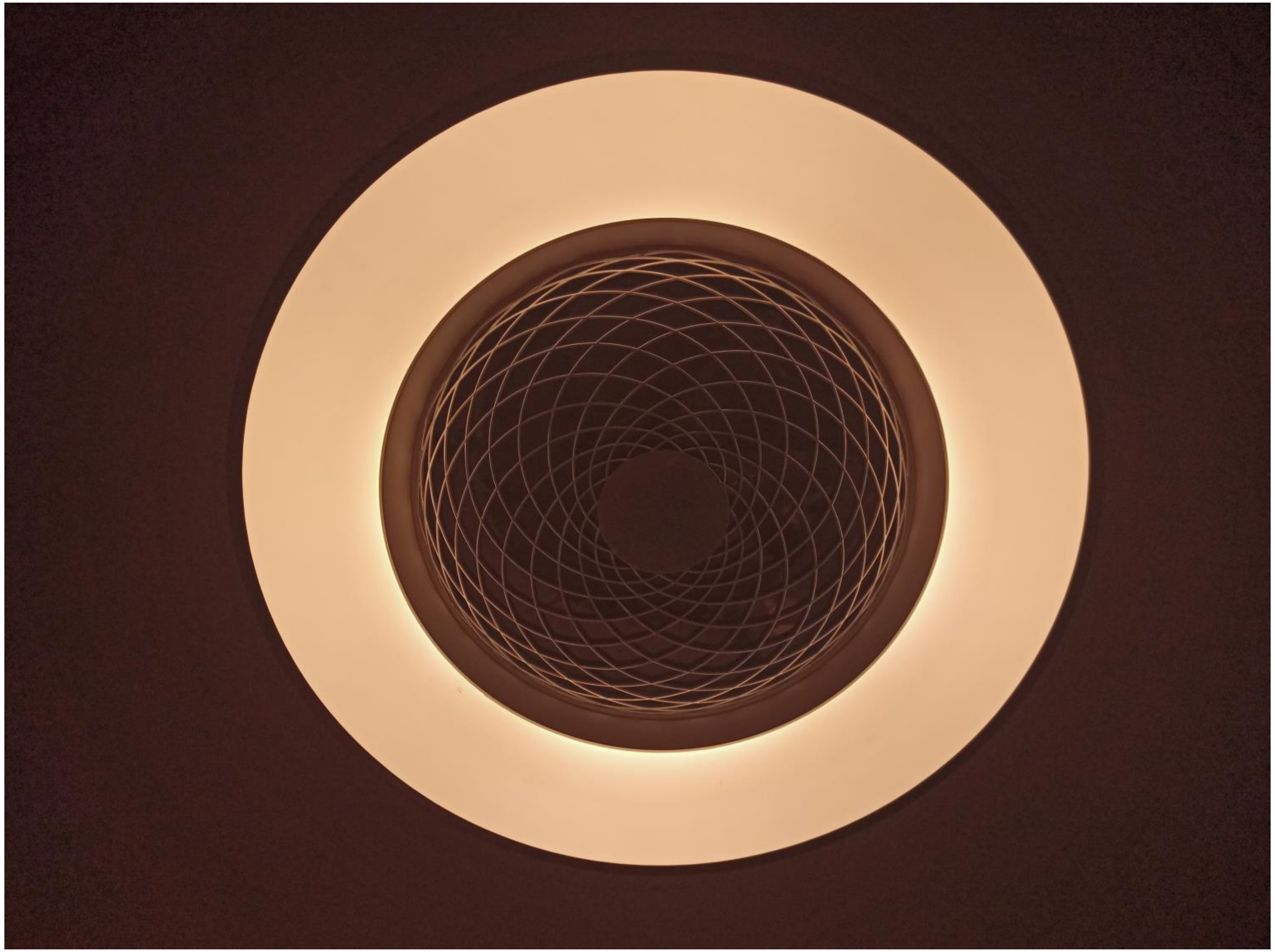


La araña entre las nubes

- **Es una muestra de que la geometría está presente en la naturaleza. Podemos observar como formando triángulos, rombos, líneas etc, se construye la telaraña.**

Logaritmos

Podemos observar varias intersecciones entre espirales logaritmicas dentro de un circulo

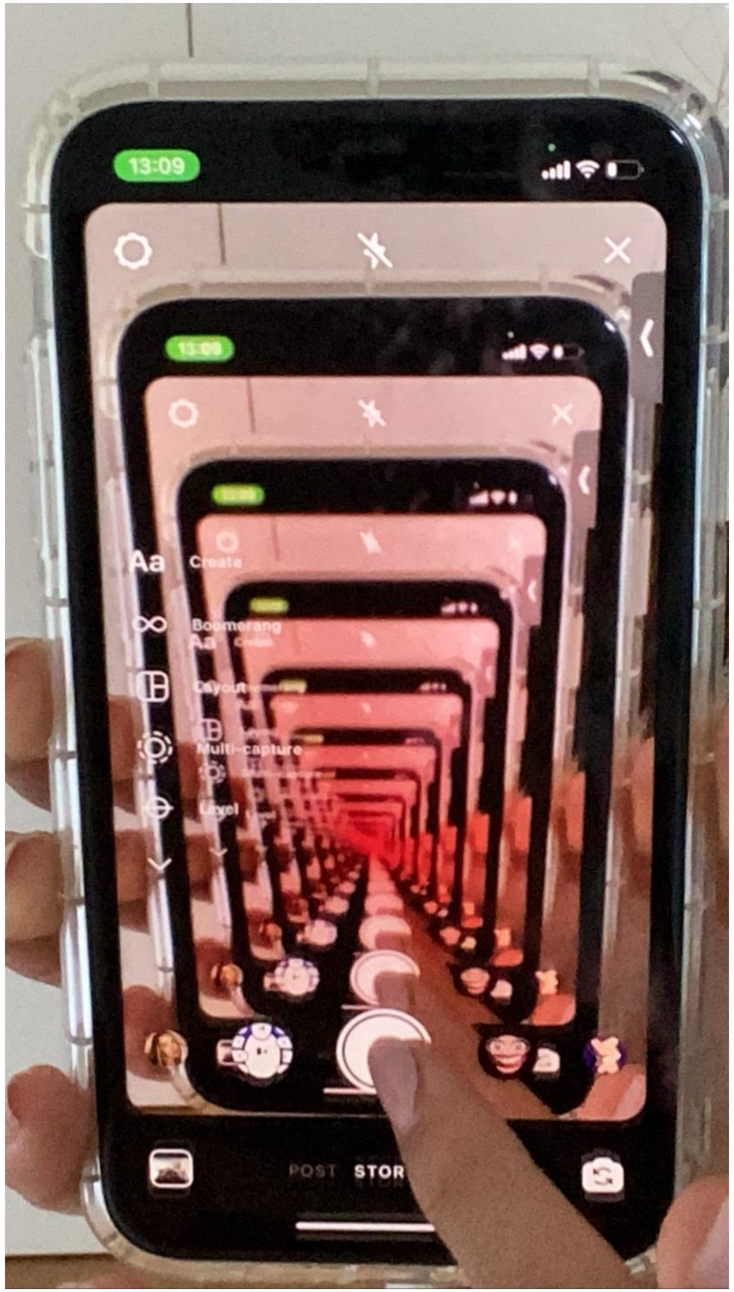


Misma secuencia

- **Es una mosquitera con líneas perpendiculares y a su vez paralelas en vertical, formando figuras geométricas infinitamente.**

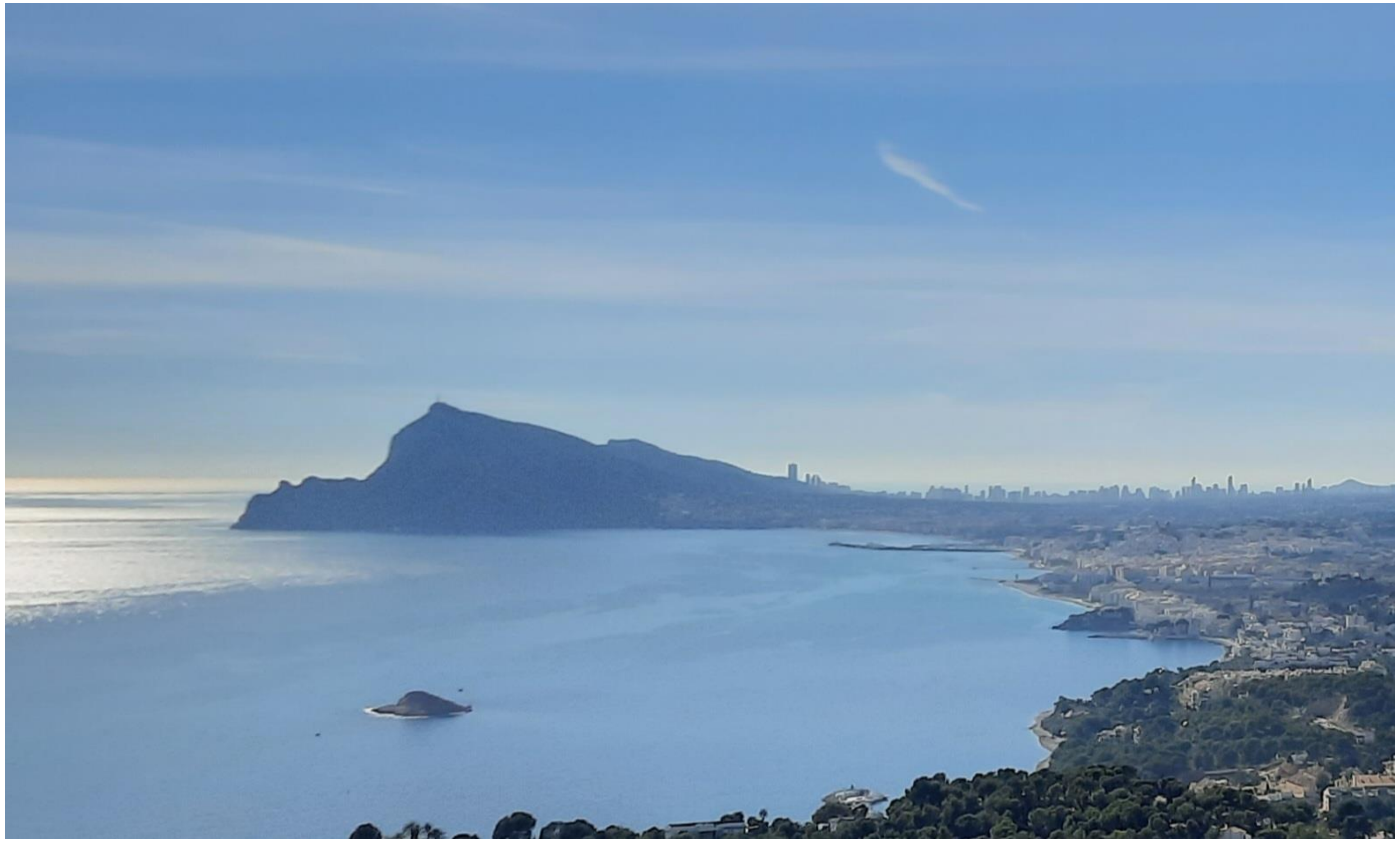
Móviles infinitos

Se ven varios móviles que no terminan nunca, son infinitos



Paisaje geométrico

La imagen es una foto de la bahía de Altea y de la bahía de Albir. Se puede ver dos triángulos escalenos, la isla y la sierra gelada, los cuales son relativos el uno con el otro. A la derecha de la sierra gelada se ven múltiples rectángulos de distintos tamaños y forma que son los edificios de Benidorm. En la bahía se pueden apreciar múltiples semicírculos cóncavos y convexos. Para finalizar se puede ver una lineal horizontal.



Triangulo escolar

- **En la foto se muestra un angulo de aproximadamente 45 grados dentro de un triangulo rectangulo incompleto ya que le falta un lado.**

Un reflejo matemático

- **Esta fotografía la tomé en mi viaje a Shanghai en el 2018. En la que se pueden observar múltiples referencias hacia las matemáticas. Desde la inversión del Jin Mao sobre el Shanghai World Financial Center, la suma de elementos diferenciales que configura la función completa; la suma de las ventanas configura la función, que es el edificio reflejado. Hasta el punto de fuga o las líneas paralelas. Un reflejo matemático.**

Waterfall- A parabola full of life

- Under the influence of gravity, and pressure from the hose, this crystalline parabolic shape comes into being. The fact that life relies on the existence of this resource, makes it, essentially, a parabola full of life.

F5.6 ISO 100 1/100 sec

- **Maths is all around us, whether we realise it or not. This may just seem like a photo of street lights however, we don’t see all the mathematical complexities that it took to create all aspects of this image, physical and digitally-as in the photo.**

Sparklers

- **Although some things may seem random or confusing, there's usually a reason or pattern behind it.**

Lizard

- **In this photo we can observe, although many, just a fraction of all the geometrical shapes found in nature.**

Mysterious Mushrooms

In this picture you can see three different sized white mysterious mushrooms with little triangular spikes on them. On the ground there are pine needles and twigs. Some of them are long and thin and some of them are smaller and thicker. They represent square and triangular shapes.

Tears hanging from the ceiling

- **In this picture you can see teardrop shaped glass which is hanging from the ceiling and is placed so that it creates a tear shape in the middle. On the walls you can see different shapes: rectangular, straight lines and cricles**

Freshly after the rain

- **This picture was taken right after rain as the caption says and you can see here different sized droplets and beautiful green leaves which represent as circles, rain droplet shapes and ovals.**

Drought

These are mathematical structures created by the cracking of the sand and earth crust when water evaporated from these pans. Basically, variations around lozenge features only related to physical forces. Picture was taken in the zone of deadvlei and later used in the family blog.

The door

The remaining of one house built on desert outskirt where human thought they would fight and dominate the environment. At least the door is still in shape even if lying on the ground. This picture was taken in Kolkmanskop, a ghost-town.

Nature playing with mathe matical features.

This Picture could be one of the representations of how climate can affect a landscape. This photo is also the example of the strength and rime placed into nature to obtain these giant Legos or dices of a few tons each. This picture was also used in the family blog and was taken in the giant rock playground.

Árbol de triángulos

- **En este árbol se pueden distinguir muchas formas, sobre todo triángulos, de varios tipos, y un gran rectángulo, de forma natural las ramas se dividen formando figuras triangulares.**

Rast u pravougaonicima - Croissance dans rectangles

Je vois des maths ici car sur le mur avec trois lignes de photos, les cadres des photos de la première ligne sont tous de même taille, et ont environ 2,5 centimètres entre elles. Il y a en tout 8 photos verticales de la première ligne. Pour les deux autres lignes, les cadres sont aussi les mêmes. il y a 6 photos dans chacune des lignes. La distance entre cadres des photos de même ligne est de 2 centimètres. La distance entre les cadres de lignes différentes est de 3,5 centimètres (par exemple la 1ère photo de la 1ère ligne et la 1ère photo de la 2ème ligne). Aussi, toutes les lignes de photos ont un milieu commun ; il y a 4 photos verticales et 3 photos horizontales de chaque côté, donc 10 de chaque côté en tout (20 photos sur tout le mur de gauche).

La magia de la geometría

- **En la foto vemos 4 circunferencias y 6 rectas secantes. 3 de las circunferencias pequeñas forman un triángulo equilátero.**

Translation Celeste

- **Ces nuages forment des lignes contenues dans deux plans parallèles et on dirait que les deux dessins sont images l’un de l’autre par une translation dans l’espace.**

El precipicio inundado

En esta imagen parece que se puede ver un pequeño precipicio, con algunas luces artificiales, esto simplemente es una ilusión. En realidad, esto no es un precipicio, sino un pequeño lago de agua en el cual, el techo se refleja sobre ella. Un truco que se hace a los visitantes de esta cueva, es pedirles que tiren una piedra y que escuchen el eco que crea. Al tirar la piedra, impacta contra el agua, rompiendo la ilusión y asombrando a los visitantes.

Playa, sol y geometría

- **Tomé esta foto en Miami Beach, Florida. En ella podemos ver la típica caseta de los vigilantes de la playa que salen en muchas películas. La caseta combina muchas formas geométricas. Además, los colores tan vivos como el rojo, el amarillo y el naranja, transmiten un sentimiento de calor y felicidad. Se puede apreciar muchas líneas paralelas además de triángulos, rectángulos, cuadrados y otras formas geométricas, entre ellas la forma curiosa de la caseta que se asemeja a un semi-sol y a la mitad de un cuadrado.**

Mundo matemático

- Mi foto de participación para este concurso es un globo terráqueo de cristal y en segundo plano se observa una pequeña plaza con una fuente y unos arboles. Mi fotografía representa la utilización de las matemáticas en el mundo, ya sea en las casas, en la simetría de los arboles, en la construcción de los edificios y en básicamente todo que presenciamos en nuestra vida cotidiana. El mundo lo represento con el globo terráqueo de cristal y las matemáticas se van representadas en la simetría de la plaza, en las formas geométricas de la fuente y todas las demás formas que se observan.

Semicuadrado infinito

Esto es una foto tomada en el castillo de Schoenfelles el verano pasado. Yo la llamo el semicuadrado infinito ya que no se ve el final de estos medio cuadrados

Concha de Fibonacci

- **Esta concha de origen Mediterráneo presenta una forma increíblemente parecida a la Espiral formada por la famosa secuencia de números Fibonacci (imagen inferior). Por ello la considero de alguna forma una manera de representar las Matemáticas. Además, se ha defendido muchas veces que dicha secuencia esta presente de manera muy común en la naturaleza que nos rodea.**

Reloj Floral

Esta foto está tomada en un jardín botánico en Singapur. Representa un reloj con la forma tradicional circular. Está rodeado por una corona circular adornada con hexágonos, y las manecillas pueden considerarse como el radio del circulo, éstas siendo con forma de triángulo. El interior está formado por cuadrados formando una composición floral. Las marcas de las horas dividen el reloj en 12 áreas de sector circular iguales

La cara Geométrica

- **Mi imagen está tomada en mi casa, con figuras geométricas de decoración, o para utilizar para comer, hay círculos, cuadrados, rectángulos etc.**

La perspectiva engaña

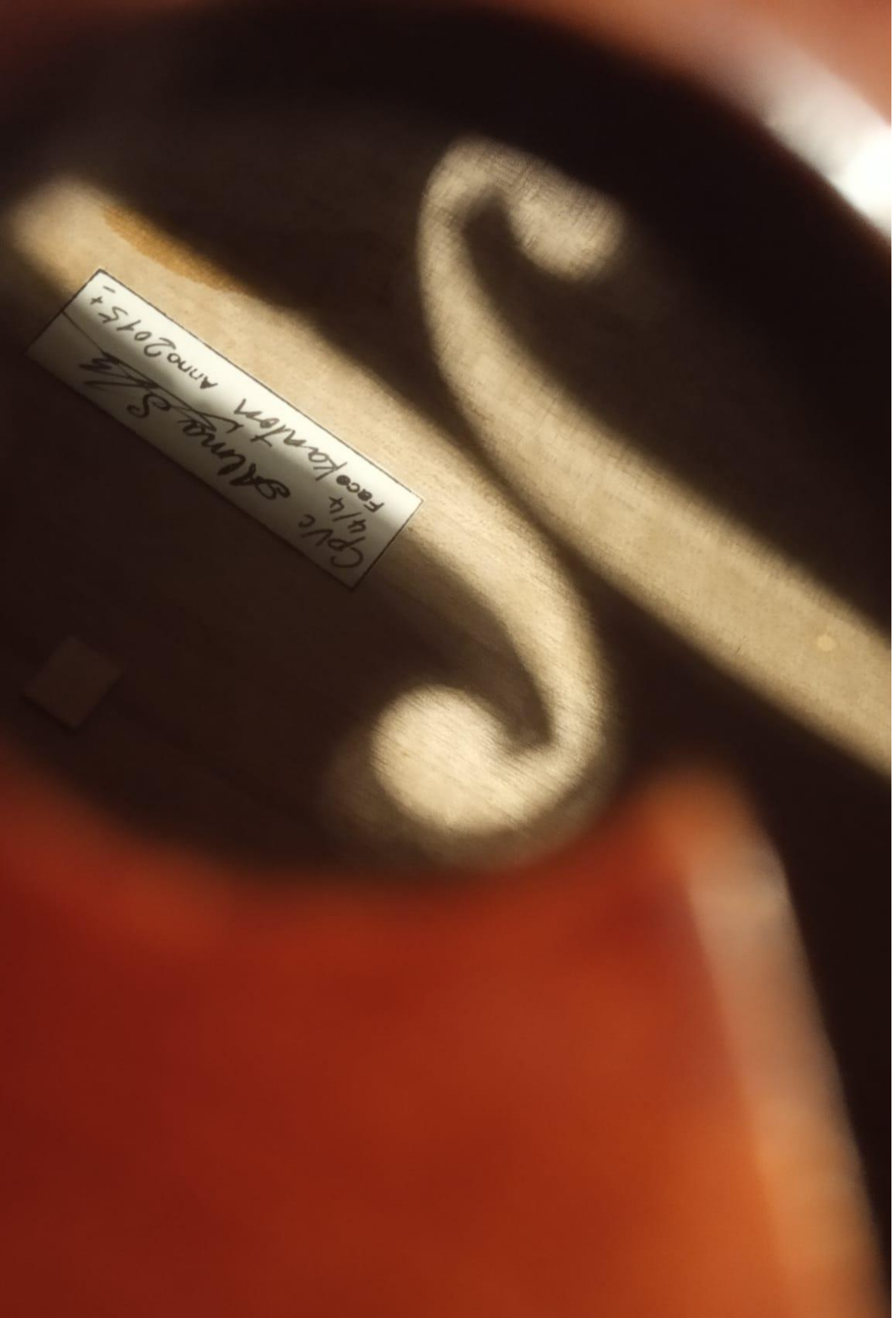
- **En esta imagen se puede ver un edificio que depende de donde lo mires cambia la perspectiva de la visión del edificio.**

Ángulos rectos

- **En esta fotografía se pueden observar varias grúas las cuales están formando ángulos rectos. El mástil (vertical) de la grúa y la pluma (horizontal) están formando ángulos de 90º cuando se cruzan entre ellas.**

Fractalechuga!

- En esta imagen se puede ver un vegetal (como ya habréis visto) que tiene unas características de un fractal ya que sus pequeños conos se van repitiendo una y otra vez al igual que un fractal



Música integral

- Esta foto recibe el nombre de “Música integral” debido a que la proyección de las efes1 (y las efes en sí) en la parte de dentro de un cello tienen la misma forma que el símbolo con el que se representan las integrales (∫). 1. Efes definición: aberturas estilizadas en la tapa de la caja del chelo que permiten a las ondas sonoras fluir con mayor libertad.Si quedan obstruidas el sonido se apaga considerablemente.

La esfera políglota

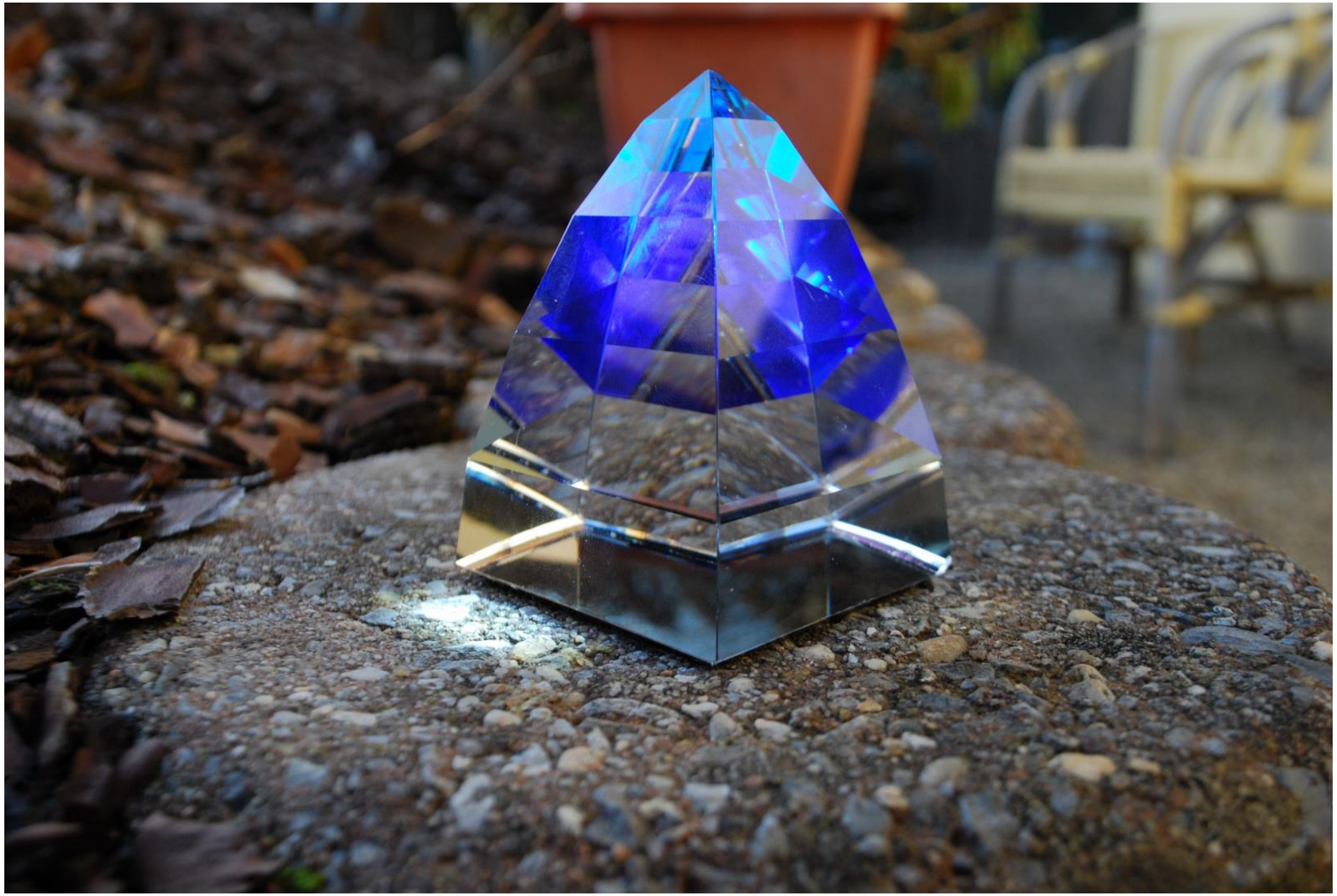
En esta foto se observa un globo terráqueo en forma de esfera. He llamado a la imagen con ese título porque es una figura geométrica (cuerpo redondo) pero no deja de representar la Tierra.

Leading lines

Lines tend to lead you to your objective, you just need to follow them

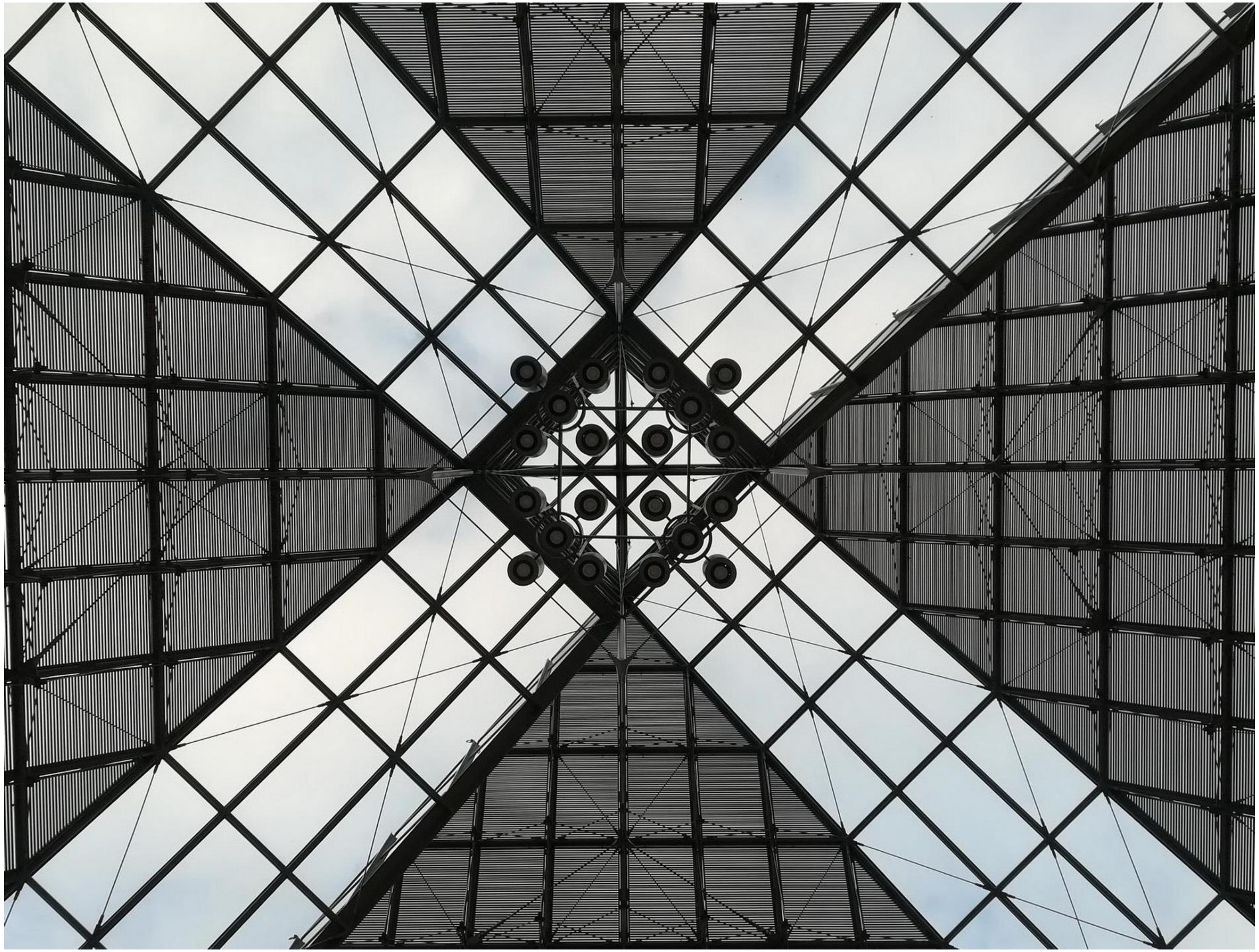
Polygonal base and apex

This picture expresses different shapes in a glass pyramid with the top layer that is blue and it gives each layer a faded blue. This photo looks pretty simply but there is a light ray from a window passing right through the glass pyramid. From the angle it looks as if there were two shapes in one. If we take a closer look, we can see how the stones that its standing has leading lines. The object, in regards to math, it has connecting a polygonal base and apex.



Rule of thirds and symmetry

This photograph was taken in Mudam the temple of modern art. From the beginning of the golden ratio to the rules of thirds and proportions, this photograph has mathematical signs which include symmetry, geometry and several shapes including circles and rectangles.



Circles

When I tried to think of what photograph I should take for this competition, I immediately took my bike and cycled down to the fields full of cut-down trees. My mathematical reasoning for this picture was that it involved cylinders and circles in nature in an unsystematic composition. Although the composition of this photograph is man-made, it still reflects nature’s composition skills through the shapes of the trunks.

Reality is just an illusion

- **By viewing something from a different perspective you understand it more completely: this is the essence of mathematics.**

This upside-down picture of a fountain in the background gives us a shift in perspective.

With the geometrical shapes of an ellipse and two arcs of a parabola, this picture creates a harmonical mathematical effect: symmetry, patterns, geometrical shapes are what make the world beautiful. The refracted image looks completely different and yet the same as the real image in the background.

Mathematics is just like this: it explains things relating them to other things.

An equal sign, in the end, is just a metaphor, an analogy beyween 2 entities.

A matter of perspective

- We live in a mathematically-driven world. Mathematics makes us understand and appreciate the world surrounding us. Everything we see, touch, hear is, in the end, related to maths. Mathematics is fundamental in pictures as well, since the composition of the image is ruled by mathematical ratios. This picture has, as well, a metaphorical meaning: each and everyone of us perceives the world in a different way. "We don't see things as they are, we see them as we are", Anais Nin said. As a matter of fact, this picture highlights the relativity of things, the sometimes mistaken perception we might have of the world.

A world of shapes

- **Maths is about finding patterns, rules that govern what we see. These umbrellas are made of 8 triagles each, which is a perfect number. A closer look, however, shows that triangles aren't the only geometrical shape here: each triangle presents a pattern of circles and lines. The latter are arranged so as to form different shapes. A pattern very similar to sine and cosine functions is observable. This picture shows how maths is all around us, how it rules the world, being present literally everywhere, which is what makes it so special. We learn something new every time we employ our ability of changing perspective. That is why mathematics is the most imaginative of all art forms and it requires a great deal of open-mindedness. Human ability to adapt to situations, to change perspective, is what defines our nature.**

Thanks

Merci

Vielen Dank

Grazie

Dank u

Kiitos

Gracias